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# Binder 077, Fellodistomatidae Monodhelminthinae A-Z [Trematoda Taxon Notebooks]

Harold W. Manter Laboratory of Parasitology

## *Monodhelmis* Dollfus, 1937

Generic diagnosis. — Monodhelminthidae, Monodhelminthinae: Body small, somewhat elongate. Oral sucker subterminal, large, followed by elongate or spherical pharynx. Esophagus short, ceca reaching to near posterior extremity. Acetabulum simple, smaller than oral sucker or nearly as large, post-equatorial. Testes anterodorsal to acetabulum, intercecal, symmetrical or not. Vesicula seminalis tubular, constricted toward middle; pars prostatica elliptical, opening directly into genital atrium. No cirrus pouch. Prostate cells surrounding attenuated distal portion of seminal vesicle and pars prostatica. Genital atrium opening in median line a little behind intestinal bifurcation, with muscular accessory sac behind. Ovary unlobed, median, pretesticular. Uterus posttesticular, intercecal; eggs numerous. Vitellaria extending in extracecal fields, commencing at level of testes or acetabulum. Excretory vesicle V-shaped, with dorsoterminal pore; arms reaching to level of esophagus or pharynx. Parasitic in digestive tract of fishes.

Genotype: *M. torpedinis* Dollfus, 1937 (Pl. 20, Fig. 250), in *Narcion torpedo* [1]); Mauritanie.

Other species: *M. arii* Yamaguti, 1953, in small intestine of *Arius*; sp. Banjermassin, Borneo.

## MONODHELMINTHIDAE Dollfus, 1937

Family diagnosis. — Body rather plump, spined. Oral sucker well developed. Pharynx present. Ceca not reaching to posterior extremity. Acetabulum simple or complex in structure, well apart from anterior extremity. Testes two, intercecal, pre-acetabular. Cirrus pouch present or absent. Vesicula seminalis free or enclosed in cirrus pouch. Pars prostatica distinct. No cirrus proper. Genital atrium median, preovarian, with accessory organ posteriorly. Ovary pretesticular, may be partly intertesticular. Receptaculum seminis and Laurer's canal present. Vitellaria in two lateral groups of follicles in fore- or hindbody. Uterus in postacetabular median field or more extensive. Excretory vesicle U- or V-shaped, with long arms reaching to level of esophagus. Parasites of fishes.

Type genus: *Monodhelmis* Dollfus, 1937.

### Key to subfamilies of Monodhelminthidae

Ceca reaching to near posterior extremity; vitellaria in posterior, lateral fields of hindbody ..... Monodhelminthinae

Ceca shorter, extending a little, if at all, beyond acetabulum; vitellaria overlapping ceca anterior to acetabulum .. Tandanicolinae

### Monodhelminthinae nom. emend.
### for Monodhelminae Srivastava, 1939

Subfamily diagnosis. — Mondhelminthidae: Body somewhat elongate, ceca long. Acetabulum simple, in middle third of body. Testes symmetri-



cal or not. Cirrus pouch present or absent. Ovary median or submedian. Vitellaria in posterior lateral fields. Uterine coils not intruding into forebody.

### Key to genera of Monodhelminthinae

Cirrus pouch present; excretory arms convergent at level of testes ..... *Mehratrema*

Cirrus pouch absent; excretory arms not convergent at level of testes ..... *Monodhelmis*

## Family: Monodhelminthidae Dollfus, 1937

Dollfus in 1937 erected a new genus *Monodhelmis* for the new species *M. torpedinis*, parasitic in the gut of a *Narcacion torpedo*. For the reception of this genus, he suggested the family Monodhelminthidae. Srivastava (1939) described a new species *Mehratrema dollfusi* from the small intestine of *Scatophagus argus* obtained from the Bay of Bengal and Arabian Sea and assigned it to the new genus *Mehratrema* under the family Monodhelmidae (Dollfus, 1937) instead of Monodhelminthidae. He differentiated the genus *Mehratrema* from *Monodhelmis* by the presence of a well developed cirrus sac, a peculiar metraterm, genital sucker and the anterior extent of the vitellaria. Chauhan (1943) gave an account of a new species *Mehratrema polynemusinis* from the intestines of the marine fishes, *Polynemus indicus*, *Muraenesox talabonoides* and *Sciaena* sp. at Bombay.

Yamaguti (1952) reported the occurrence of *Monodhelmis arii* n.sp. in the small intestine of *Arius* sp. A year after, the same author included two more genera in the family Monodhelminthidae, i.e. *Prosogonarium* Yamaguti, 1952 and *Tandanicola* Johnston, 1927.

So far, the family Monodhelminthidae comprises four genera, namely *Mehratrema*, *Prosogonarium*, *Monodhelmis* and *Tandanicola*. In the new species, *Buckleytrema indica*, the testes are obliquely situated one behind the other and they are post-acetabular or the posterior testis alone is post-acetabular while the anterior testis is partly or completely superimposed by the acetabulum; a cirrus sac is present; the vitellaria do not extend behind the testes; the ovary is pre-acetabular; the intestinal caeca do not reach the posterior end of the body. The species with these characters cannot be accommodated in any of the known genera of the family Monodhelminthidae. Since the acetabulum lies between the ovary and the testes, therefore the diagnostic characters of the family have also been emended.

Family diagnosis (emended).

Body: rather plump. Integument: spinous or non-spinous. Suckers: oral sucker well developed; acetabulum simple or complex in structure apart from anterior extremity. Gut: prepharynx and pharynx present; oesophagus distinct; intestinal caeca not reaching the posterior extremity. Reproductive systems: Male—testes two intercaecal, pre- or post-acetabular, obliquely or side by side placed; cirrus pouch present or absent; vesicula seminalis free or enclosed in cirrus pouch; pars prostatica distinct; no cirrus proper; genital atrium median, pre-ovarian with accessory organ directed posteriorly. Female—ovary pre-acetabular and pretesticular or may be partly intertesticular; receptaculum seminis and Laurer's canal present; vitellaria in two lateral groups of follicles; uterus in post-acetabular median field or more extensive. Excretory system: excretory vesicle U- or V-shaped.

Parasites of fishes.

Type genus: *Monodhelmis* Dollfus, 1937.

From N. K. Gupta, 1956

Monodhelminthidae Dollfus,1937 new family Dollfus

MONODHELMIS Dollfus, 1937

Elongated distomes (more than twice as long as wide , flattened dorso-ventrally, not inflated or enlarged. Cuticule very finely spined almost to posterior end. Oral sucker terminal, large, weakly muscular. Acetabulum weak, located near the limit between the 2 last fourths of the body length. No prepharynx; pharynx elongated, cylindrical, capable of projection into the cavity of the oral sucker and followed by an esophagus a little longer than it.

Lumen of anterior cavity of esophagus dilated and in this region exhibits a muscular especially glandular structure. The ceca diverge at a slender angle and extend to the last tenth of the body length.

Excretory vesicle V-shaped, branches reaching from posterior end of body to region of esophagus, accompanying the intestinal ceca, without dilations or branches.

Genital pore almost halfway between intestinal bifurcation and acetabulum a little anterior to mid-body. Genital sinus very voluminous, folded, recalling that of Ptychogonimus, of Stodistoma, and some Hirudinellas. The ejaculatory duct penetrates into the genital sinus without cirrus or cirrus sac; there is a pars prostatica and a rather long seminal vesicle. Testes two, oval and contiguous, right a little in front of left; The left in acetabular region, leaving a certain space between them and the ceca. Ovary indistinct, appearing to be in contact with anterior border of right testes. Seminal receptacle? Laurer's Canal? Vitelline follicles very small, extending on each side, outside the ceca, between region of testes and that of the ends of the ceca. Vitelline ducts passing anterior to testes, uniting between the testes. Uterus posttesticular and intercecal, in posterior fourth of body, the terminal portion passing along the left side to join the genital sinus. Eggs operculated with thin shell, 40 to 45μ long. Digestive tube of Selachians. Type species: M. torpedinis Dollfus, 1937

Dollfus named a new family Monodhelminthidae for this genus and Price,1940, points out that the genus may possibly belong to the Opisthorchioidea.

Other species:
M. arii Yamaguti, 1952

## Liste des *Monodhelminthidae* + *Tandanicolidae*

### I. Espèces parasites de siluriformes (Nématognathes)

| | | |
|---|---|---|
| A. chez *Arius*, dans le tube digestif. | | |
| *Monodhelmis torpedinis* R. Ph. Dollfus 1937 *a* p. 169-171, fig. 3, 1937 *b*, p. 489-492, fig. 50-60. | *Arius heudeloti* (Valenciennes, 1840). | Mauritanie. |
| *Monodhelmis torpedinis* R.-Ph. *D. sensu* J. B. Fischthal et J.-D. Thomas, 1968, p. 131-133, fig. 4-6. | *id.* | Ghana. |
| *Monodhelmis arii* S. Yamaguti, 1952, p. 185-187, pl. V, fig. 24. | *Arius* sp. | Bandjermasin (Bornéo). |
| *Monodhelmis philippinensis* C. C. Velasquez, 1961, p. 523-524, fig. 2. | *Arius thalassinus* (Rueppell, 1835). | Manila (Philippines). |
| *Prosogonarium arii* S. Yamaguti, 1952, p. 187-191, pl. V, fig. 21-23. | *Arius* sp. | Bandjermasin (Bornéo). |
| *Paramonodhelmis postacetabulorchis* P. G. Oshmarin et J.-L. Mamajev, 1963, p. 357-359, fig. 1. | *Arius* sp. | Baie du Tonkin (Nord-Vietnam). |
| B. chez des Siluriformes indéterminés, dans le tube digestif. | | |
| *Buckleytrema indica* N. K. Gupa, 1956, p. 75-78, fig. 7. | « marine cat-fish ». | Golfe de Manaar (Inde). |
| *Mehratrema dollfusi* H.D. Strivastava, *sensu* N. K. Gupta, 1956, p. 78, 79, fig. 8 (1). | *id.* | *id.* |
| C. chez *Tandanus*, | | |
| 1° dans le tube digestif. | | |
| *Burnellus trichofurcatus* (Johnston et Angel, 1940). L.-M. Angel, 1971, p. 375-383, fig. 1-5. | *Tandanus tandanus* Mitchell, 1838. | River Murray (South Australia). |
| 2° dans la vessie natatoire. | | |
| *Tandanicola bancrofti* T. H. Johnston, 1927, p. 133-136, pl. B, fig. 1-5 (2). | *id.* | *id.* |

### II. Espèces parasites de Téléostéens d'autres groupes (Perciformes, Polynemiformes, Congriformes) dans le tube digestif

| | | |
|---|---|---|
| *Mehratrema dollfusi* H. D. Srivastava, 1939, p. 97-99, pl. IV. | *Scatophagus argus* (L. 1766). | Karachi et P. (Inde). |
| *Mehratrema polynemusinis* B. S. Chauhan, 1943, p. 133-136, fig. 1-3. | *Polynemus indicus* Shaw. | Bombay. |
| | *Muraenesox talabonoides* (Bleeker). | *id.* |
| | *Sciaena* sp. | *id.* |

Jusqu'à présent, une seule forme larvaire a été attribuée aux *Monodhelminthidae* c'est *Cercaria* (*Furcocercaria*) *trichofurcata* T. H. Jonhston & M. Angel (1940, p. 331-334, fig. 1 sporocyste branchu, fig. 2-7 cercaire), parasite de *Corbiculina angasi* (Primes) (*Lamellibranchiata Heterodonta*) de Murray River (South Australia). Cette cercaire fut supposée, par T. H. Jonhston & M. Angel (1940, p. 334) probablement celle de *Tandanicola bancrofti* J. H. Johnston. Ultérieurement, L. Madeline Angel (1971, p. 375) a rapporté cette cercaire à une autre espèce de distome, parasite intestinal de la même espèce de *Tandanus* de Murray River. L'adulte a été décrit sous le nom « *Burnellus trichofurcatus* (Johnston & Angel 1940) » par M. L. Angel (1971, p. 375-383, fig. 1-5) qui l'a placé dans la famille *Fellodistomatidae*, *sensu* R. M. Cable 1953, ce qui est à mon avis une erreur. Pour moi, *Burnellus* est tout au plus un sous-genre de *Monodhelmis*, que je considère comme très éloigné des *Fellodistomatidae*. Je ne m'accorde pas avec R. M. Overstreet (1969, p. 121) pour placer les *Monodhelminthinae* dans les *Fellodistomatidae*.

(over)

Ma conception des *Fellodistomatidae* (W. Nicoll, 1909), T. Odhner, 1911, très différente de celle de R. M. Cable (1953, p. 416-417), je l'ai exposée antérieurement (R. Ph. D. 1952, p. 373-377 ; 1965, p. 762, 767-770) et je ne crois pas utile de l'exposer à nouveau, n'ayant pas à la modifier. Dans sa « Revision of Fellodistomoidea », H. R. Mehra (1963, p. 371) a placé dans cette super-famille les *Monodhelminthidae*, ce qui est, pour moi, inadmissible. Je ne m'attarderai pas ici à discuter cette attribution. Toutefois, je crois utile de rappeler que H. R. Mehra a distingué 5 sous-familles de *Monodhelminthidae* : *Monodhelminthinae* Srivastava 1939, *Mehratrematinae* Srivastava 1939 (avec les genres *Mehratrema* Srivastava 1939 et *Buckleytrema* Gupta 1956), *Tandanicolinae* Johnston 1927, *Prosogonariinae* Mehra 1963, *Atractonematinae* Mehra 1963.

Je ne suis pas d'accord avec Mehra pour placer la s.f. *Atractonematinae* dans les *Monodhelminthidae*. En effet, *Atractonema* S. Goto & Y. Osaki 1929, ayant la vessie excrétrice en Y n'appartient pas au même phylum et beaucoup d'autres caractères ne sont pas compatibles avec les *Monodhelminthidae* ; l'ovaire est post-testiculaire, la poche du cirre ne peut pas être assimilée à un « accessory organ ».

De la famille *Monodhelminthidae* R. Ph. Dollfus (1937 *a*, p. 272 : 1937 *b*, p. 489), je donne la définition ci-après.

Distomes *Prosostomata* à cuticule spinulée (1), pourvus, en avant de la ventouse ventrale, des testicules et, au moins en partie, de l'ovaire, d'un organe intercaecal, médian, particulier, dit « accessory genital organ », « muscular accessory organ », « accessory reproductive organ », « accessory-copulatory organ », se terminant antérieurement par un atrium ou sinus génital. La structure de cet organe diffère selon l'espèce. Deux testicules complètement ou en partie préacetabulaires (*Monodhelmis, Burnellus, Mehratrema, Prosogonarium*), ou complètement postacétabulaires (*Buckleytrema*), ou en partie postacétabulaires (*Paramonodhelmis*). Vessie excrétrice en V ou en U, croisant l'intestin, s'étendant antérieurement jusqu'au niveau de l'œsophage ou du pharynx, ou presque. Parasites de Téléostéens, principalement Siluriformes.

From Dollfus, 1973

## Family Monodhelminthidae
## *Monodhelmis torpedinis* Dollfus, 1937
## (Figs. 4–6)

HOST: *Arius heudeloti* Cuvier and Valenciennes, sea catfish (Ariidae).

HABITAT: Small intestine.

LOCALITIES: Tema, Cape Coast, Iture, Elmina; Ghana.

DATES: 13 January (Elmina), 21 February (Iture), 16 March (Cape Coast); 1966.

SPECIMENS: USNM Helm. Coll. No. 63184.

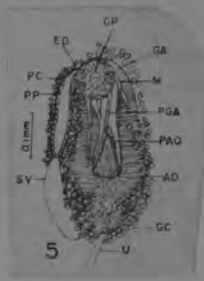
DESCRIPTION (based on 20 adult specimens; 10 measured): Body 2,353–2,615 by 550–640, widest at gonadal level, ends blunt. Tegument entirely covered with fine spines. Forebody 1,215–1,360 long; hindbody 926–1,045 long, shorter than forebody. Oral sucker subterminal ventral, somewhat funnel-shaped, 230–265 by 215–242, longer than wide, with wide opening into prepharynx; preoral lobe 6–24 long. Acetabulum 203–218 by 196–220, round to longitudinally elongate, center at level of anterior one-half to three-fifths of body length. Sucker length ratio 1:0.81–0.93. Prepharynx very short, thick-walled, muscular. Pharynx 121–138 by 96–116, longitudinally elongate, conspicuously constricted or with only very slight indication of constriction near midlength, unlobed anteriorly; entrance to pharyngeal lumen surrounded by cup-like modification composed of longitudinal muscles, some of lateral fibers of cup continuing posteriorly through center of each pharyngeal lobe, remainder of lobe with circular muscles. Esophagus thin-walled posteriorly and muscular anteriorly, latter with inner longitudinal and outer circular muscles; muscular part 61 (contracted)–176 (extended) long. Cecal bifurcation 680–800 preacetabular; ceca cell-lined, extending to posterior extremity (at level of excretory pore) or not so far, postcecal space 51–210 long.

Testes two, about same size, smooth, longitudinally elongate, intercecal, in contact with ceca or not, symmetrical or anterior margin of right testis slightly ahead of left, in contact or not, partly overlapping anterior part of acetabulum; right testis 242–270 by 138–191, left testis 242–270 by 140–187. Terminal male genitalia dextral, between accessory genital organ and right cecum. Cirrus sac and cirrus lacking. Seminal vesicle 167–246 by 52–100, saccular, undivided, thick-walled, muscular, commencing ventral to anterior part of right testis or in contact with latter, ventral to ovary. Pars prostatica an elongate vesicle, 146–218 by 37–68, thick-walled, muscular, cell-lined, surrounded by compact layer of prostate cells. Ejaculatory duct observed in two specimens, 22 by 11 and 29 by 15, very short, opening into right side of genital atrium. Latter 116–148 by 121–160, very large, cavity large, dorsoventrally oriented; in ventral view walls composed of outer moderately thick and inner thin dorsoventrally oriented muscle layers, very thick anteroposteriorly oriented ring of circular muscles between them, inner walls much plaited; muscles layers, plaited walls and lumen continuous with those of accessory genital organ. Latter 205–242 by 148–182, large, flask-shaped, very thick walled, anteroposteriorly oriented, may overlap left cecum ventrally, lumen 58–77 wide posteriorly; muscle layers of genital atrium change their orientation with regard to long axis of body as they bend sharply posteriorly and continue into accessory organ: outer and inner layers now longitudinal muscles, middle layer in dorsoventrally oriented ring; outer longitudinal muscles on one side continuous around posterior end of accessory organ and are longitudinal muscles of other side; at posterior end a broad band of some of the outer longitudinal muscle fibers from each side turn anteriorly through the midcenter of solid concentric circular muscles which completely surround this band and continue into a large projection lying free in lumen, projection covered by thin, compact circular muscle layer, projection 100–145 by 51–60 (at base); a very thin band of muscle fibers extending from posterior limits of inner longitudinal muscles of one side of lumen to those of other side, passing through midcentral band of fibers entering projection; thick mass of gland cells externally capping posterior end of accessory organ, some cells on other parts of latter. Genital pore median, 335–420 preacetabular, 815–970 from anterior extremity, at level of anterior one-third to two-fifths of body length, half way between cecal bifurcation and acetabulum or slightly more anteriorly.

Ovary 172–201 by 160–196, trilobed, dextral, in contact with right testis or overlapping it and accessory organ dorsally, lying 23–70 preacetabular. Seminal receptacle and Laurer's canal not seen. Vitelline follicles in extracecal fields, some few overlapping ceca ventrally, extending from level of anterior part of testes or more posteriorly at acetabular level to 165–345 from posterior extremity, anteriormost as well as posteriormost levels of each field subequal; right and left vitelline ducts coursing anteriorly ventral to cecum on its side, arching medianly anterior to testis on its side, uniting in notch between testes to form vitelline reservoir. Uterus mainly intercecal in hindbody, posteriorly overlapping ceca and barely extending extracecally in some, descending and ascending between testes, dorsal to accessory organ, opening into genital atrium sinistrally. Eggs numerous, yellowish, moderately thick-shelled, operculate, 27 measuring 32–39 by 21–28.

Excretory bladder V-shaped, cell-lined, arms dorsal and intercecal in hindbody, ventral and extracecal in forebody, crossing ceca ventrally at ovarian level, extending anteriorly to esophageal level; excretory pore subterminal dorsal, 46–80 from posterior extremity.

DISCUSSION: Our collection consists of six specimens from one host from Tema, and three, five and six, respectively, from three of five fish examined from the Cape Coast area (includes Iture and Elmina). *M. torpedinis*


was inadequately described from a single worm from an electric ray, *Narcacion torpedo* Klein (probably a synonym of *Torpedo narke* Risso) (Torpedinidae), from Mauritania, by Dollfus (1937). We agree with Yamaguti (1952) that the ray probably is an accidental host, having ingested a teleost harboring the adult worm. The two other species in the genus, *M. arii* Yamaguti, 1952 (Borneo) and *M. philippinensis* Velasquez, 1961 (Philippines), as well as our specimens of *M. torpedinis*, are all from sea catfishes, *Arius* spp. Dollfus (1937) stated that the postcecal space in his specimen is 0.055 mm long, but his illustration shows that it is at least three times longer. We noted in our Tema specimens that the postcecal space is 100–210 long, resembling Dollfus' worm, whereas in the Cape Coast area specimens it is only 51–75 long; in our opinion these differences represent intraspecific population variations. While Dollfus does not state that the ovary is trilobed, his illustration appears to show this condition; we are unable to reconcile the difference in appearance of the oral sucker. Dollfus shows the pharynx partially projecting into the oral cavity. While this phenomenon was not noted in our specimens, the opening into the oral sucker is certainly wide enough to allow the pharynx to enter it. We believe that the constriction noted by us on the pharynx is the level to which it enters the oral cavity; it probably is then held in this position by the contraction of the oral sucker musculature around the pharynx. We also believe that the cup-like modification of the entrance to the pharynx assists in feeding when the pharynx is projecting into the oral cavity.

We have examined the holotype and a paratype specimen of *M. philippinensis* (USNM Helm. Coll. No. 39478), and find them much flattened and difficult to interpret. The illustration of this species by Velasquez (1961) shows the holotype specimen. In the explanation of the plate it is stated that the figure is a ventral view, whereas it actually is a dorsal view. The structure labeled SR is not the seminal receptacle, but the ovary which appears to be bi- or trilobed. A seminal receptacle was not seen. The structure labeled OV is not the ovary, but the seminal vesicle. The structure labeled VS is not the seminal vesicle but some dark staining granules along the wall

the lumen of the accessory genital organ; the seminal vesicle lies dextrally between the accessory organ, ovary, and right cecum. The accessory organ, as far as can be ascertained, is basically similar to that described by us for *M. torpedinis*. The excretory arms do not extend to the oral sucker, but only to the pharyngeal level. The eggs are operculate, measuring 53–63 by 24–30. *M. philippinensis* differs from our specimens in having much longer eggs, a round oral sucker, and an entirely muscular esophagus, and in the vitelline follicles not extending as far posteriorly. *M. arii* differs from our specimens in having an unlobed ovary, a round oral sucker, a pharynx trilobed anteriorly, and an entirely muscular esophagus, and in the vitelline fields being relatively short. *M. philippinensis* differs from *M. arii* in being larger, in the greater length of the vitelline fields, the more posterior extension of the ceca, and in having the ovary lobed, and the pharynx bilobed anteriorly.

From Fischthal & Kuntz, 1968

## Monodhelmis torpedinis Dollfus, 1937

J'ai fondé ce genre et cette famille sur un seul individu, trouvé par Théodore Monod dans le tube digestif de *Narcacion torpedo*, Klein, 1742 (= *Torpedo narce*, Risso, 1810), dans les parages du Cap Blanc de Mauritanie (mai 1923). S. Yamaguti (1953 p. 175, note et 1958, p. 257, note) a été d'avis que l'hôte véritable devait être un Téléostéen, une seconde espèce de *Monodhelmis* ayant été trouvée par lui chez un *Arius*. Chez Torpedo, il s'agissait d'une présence accidentelle. Le véritable hôte était un *Arius*. En effet, à la même date et sur le même lieu de pêche, des *Arius* (= *Tachysurus*) *heudeloti* (A. Valenciennes, 1840) (Nematognathe, fam. *Ariidae* = *Tachysuridae*) ont été récoltés et Th. Monod trouva dans leur tube digestif de nombreux specimens de *Monodhelmis torpedinis* R. Ph. D. ; ils étaient dans leur hôte normal.

Je donne ci-après une nouvelle description de cette espèce, ayant comparé les spécimens trouvés chez *Arius* à l'unique specimen-type (accidentel chez *Torpedo*).

| | Dimensions du spécimen-type provenant de *Torpedo* | Dimensions moyennes d'individus provenant d'*Arius* |
|---|---|---|
| Longueur du corps ..... | 1,7 mm | 1,65 à 2 mm |
| Largeur ..... | 0,5 | 0,6 |
| Ventouse orale | 0,24 × 0,22 | 0,25 |
| Ventouse ventrale ..... | 0,15 × 0,11 | 0,20 |
| Pharynx ..... | 0,12 × 0,07 | 0,15 × 0,09 |
| Œsophage .... | 0,04 | 0,025 |
| Œufs (μ) ... | 40-45 × 23 | 37,5-40 × 25-26 |

DESCRIPTION D'APRÈS DES INDIVIDUS DE L'INTESTIN D'*Arius* (= *Trachysurus*) *heudeloti* (Valenciennes 1840).

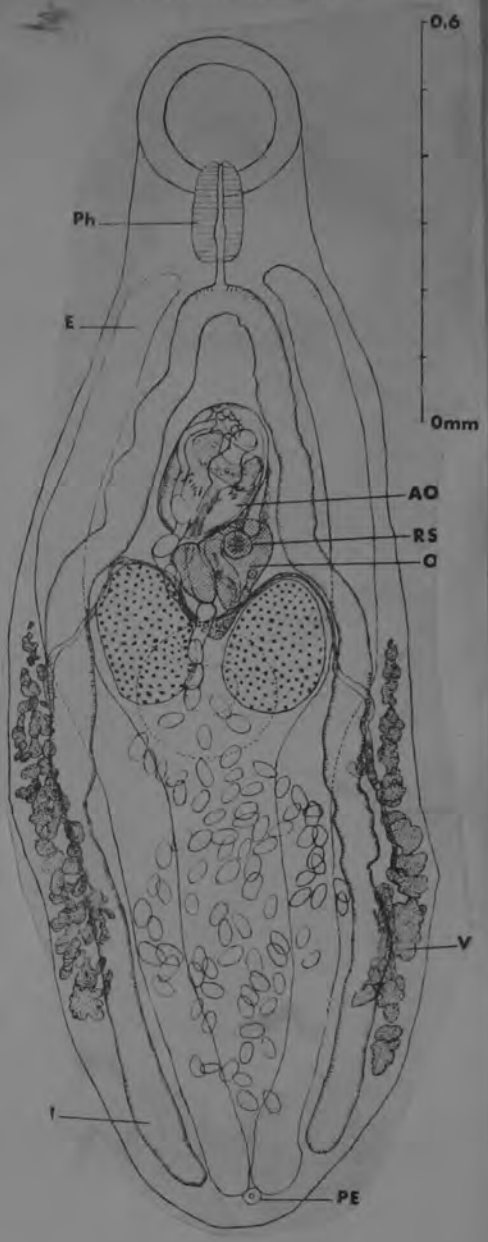
Distome allongé, à peu près trois fois plus long que large, plat, à extrémités arrondies. L'extrémité antérieure est souvent dilatée au niveau de la ventouse orale. Cuticule mince, très finement et densément spinulée presque jusqu'à l'extrémité postérieure. Ventouse orale terminale, grande, à vaste cavité et forte musculature. Prépharynx extrêmement court. Pharynx subcylindrique, environ deux fois plus long que large ; son extrémité antérieure fait saillie dans la cavité de la ventouse orale chez quelques individus. Œsophage de longueur variable, généralement plus court que la mi-longueur du pharynx, parfois beaucoup plus long. Caeca intestinaux larges, divergeant à angle aigu et atteignant presque l'extrémité postérieure du corps ; leur paroi est bordée d'une épaisse assise de cellules. Ventouse ventrale ayant son bord antérieur vers la mi-longueur du corps ou un peu en arrière, située toute entière dans la partie postérieure du corps, sa musculature est moins puissante que celle de la ventouse orale.

Testicules ovales, subégaux, généralement au contact l'un de l'autre par leur bord interne, mais pouvant aussi être séparés par un petit espace ; souvent, ils ne sont pas tout à fait au même niveau, l'un s'avançant plus que l'autre en direction antérieure ; ils sont contigus aux caeca par leur bord latéro-externe et empiètent sur le niveau antérieur de la ventouse ventrale par leur bord postérieur. Vésicule séminale allongée, paraissant presque tubulaire et rétrécie vers son milieu, débutant contre le bord antérieur du testicule droit, se continuant en direction antérieure par une *pars prostatica* environnée de glandes prostatiques et s'étendant contre le bord droit de l' « accessory organ », puis s'ouvrant dans le sinus génital, qui occupe la cavité antérieure de l' « accessory organ ». Il y a un receptaculum seminis, à contour à peu près circulaire, mesurant environ 30 × 40 μ, contenant des spermatozoïdes ; il est situé ventralement à l'ovaire, près du bord antérieur gauche de celui-ci (fig. 1 RS).

L' « accessory organ » est une formation bien délimitée, de forme ovale, mesurant environ 0,215 × 0,145 mm chez les individus de taille moyenne : il est un peu incliné par rapport à l'axe longitudinal du corps et occupe presque tout l'espace intercaecal à son niveau. Cet organe comprend deux parties : *a*) l'antérieure, creuse, est occupée par un vaste atrium ou sinus génital, s'ouvrant par le pore génital, situé dans une aire circulaire délimitée, ressemblant un peu au bord d'une ventouse. Les bords de l'ouverture sont frangés de lobes irréguliers ; *b*) la postérieure est un massif musculaire comprenant des fibres circulaires très développées, des fibres longitudinales et des fibres obliques entrecroisées ; il n'est traversé par aucun canal observable. Chez le spécimen de la fig. 1, son bord antérieur fait saillie dans la cavité atriale par trois protubérances antérieurement arrondies ; deux latérales et une médiale ; celle-ci est souvent brièvement pédonculée et renflée quelque peu en forme de champignon.

Sur les préparations *in toto*, l'aspect de l' « accessory organ » varie beaucoup selon

(over)



ividu, son état de dilatation, son orientation, son inclinaison vers la face dorsale ou vers ce ventrale (fig. 2 et 3). Pour une bonne étude de sa structure, de nouvelles recherches ccessaires et il faudra avoir des matériaux mieux conservés que ceux à ma disposition.

l'ovaire est submédian ; par son bord antérieur, il est au contact de l'accessory organ, létant souvent plus ou moins sur lui, il est au contact du testicule droit et souvent du testicule gauche. Il comprend deux grands lobes ovales, peut-être trois, étroite- réunis. Il arrive qu'il empiète sur le testicule droit plus dorsal que lui (fig. 2). Il re environ 0,15 × 0,10-0,12.

Les vitellogènes sont constitués par d'assez gros follicules de forme irrégulière. Ils tent vers la mi-longueur du corps et se terminent vers la limite entre le 6e et le 7e de ngueur du corps ; ils sont presque complètement extracaecaux, mais quelques follicules ètent sur l'intestin, la plupart ventralement, quelques-uns dorsalement.

Les vitelloductes ascendants passent ventralement à l'intestin et aux testicules, les loductes transverses longent le bord antérieur des testicules ou s'étendent plus en avant 2 VG). Le réservoir vitellin est dans l'espace intertesticulaire, à peu près au milieu de ngueur et de la largeur du corps, à peu près au niveau du bord antérieur de la ventouse rale, ou légèrement plus en avant (fig. 2).

L'utérus est en grande partie intercaecal et posttesticulaire ; antérieurement, il passe lement aux testicules, à l'ovaire, au réservoir vitellin et au vitelloducte gauche, puis lement ou dorso-latéralement à l' « accessory organ » du côté gauche, pour s'ouvrir le sinus génital.

Les œufs sont operculés et à coque peu épaisse.

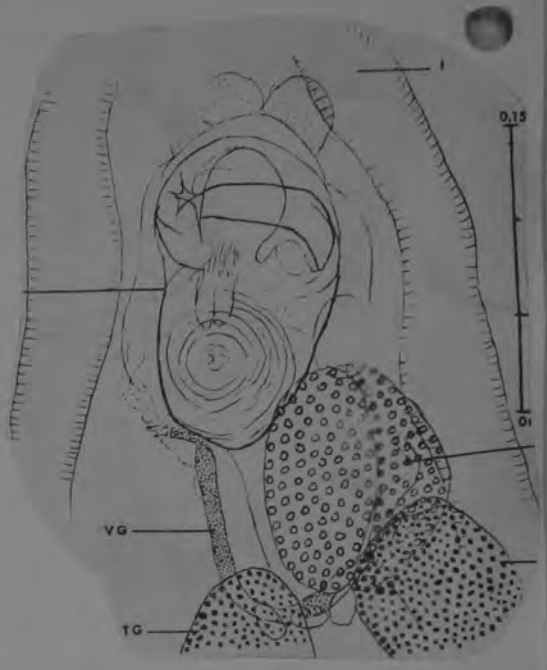
La vessie excrétrice est en V, à branches larges, qui suivent ventralement le trajet des ches intestinales ; elles sont dans l'espace intercaecal dans la moitié postérieure du s, puis croisent les caeca et s'étendent en dehors d'eux jusqu'au niveau de l'œsophage. ore excréteur est dorsal.

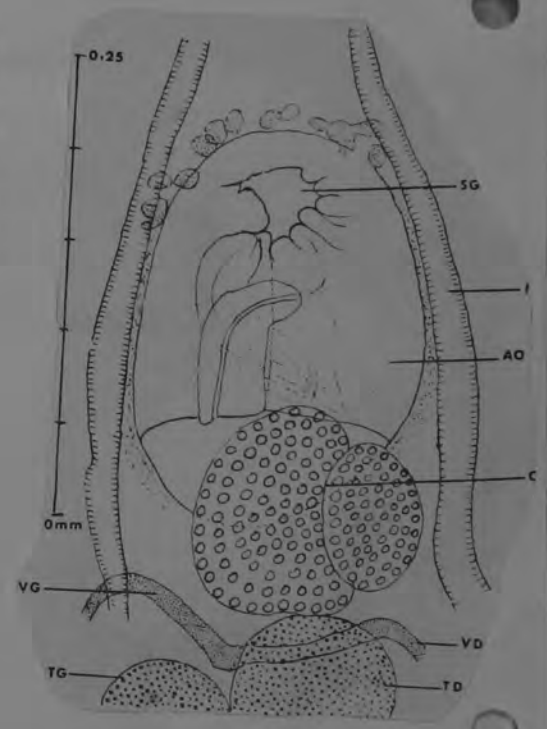
J. H. Fischthal et J.-D. Thomas (1968, p. 131-133, fig. 4-6) ont décrit un *Monodhelmis* l'intestin grêle d'*Arius heudeloti* (Valenciennes), récolté en plusieurs stations de la côte hana et l'ont considéré comme étant *M. torpedinis* Dollfus. L'exactitude et la précision description et des figures données par Fischthal et Thomas ne pouvant pas être mise oute, je ne crois pas possible d'admettre qu'il s'agit de la même espèce. Le *Monodhel-* d'*Arius heudeloti* (Valenciennes) au Ghana est très voisin de celui parasitant le même en Mauritanie, mais il s'en éloigne quelque peu par la constriction plus ou moins tuée du pharynx près de sa mi-longueur, la structure différente de l'accessory organ, la e différente de l'ouverture du sinus génital.

Je suis d'avis qu'il s'agit d'une espèce vicariante de *M. torpedinis* R.Ph.D.

La famille *Monodhelminthidae* R. Ph. Dollfus (1937 *a*, p. 272 ; 1937 *b*, p. 489) s'est coup augmentée depuis sa création. Les genres et espèces qui lui ont été attribués e 1937 et 1953 ont été admis par S. Yamaguti (1957, p. 256-259) dans les 2 sous- illes : *Monodhelminthinae* (H. D. Srivastava (1939, p. 98-99) et *Tandanicolinae* H. Johnston (1927, p. 136). Il se trouve que des genres et espèces décrits entre 56 et 1971 peuvent aussi être admis dans ces 2 sous-familles, en modifiant quelque les diagnoses qui en ont été données par Yamaguti en 1957. Rappelons que la s.f. *ndanicolinae* T. H. Johnston a été retirée des *Monodhelminthidae* et est devenue une ille : *Tandanicolidae* K. I. Skrjabin 1965 *in* Skrjabin 1966, p. 7-8, ce qui donne s d'homogénéité aux *Monodhelminthidae*.

From Dollfus, 1973



Monodhelmis torpedinis Dollfus, 1937

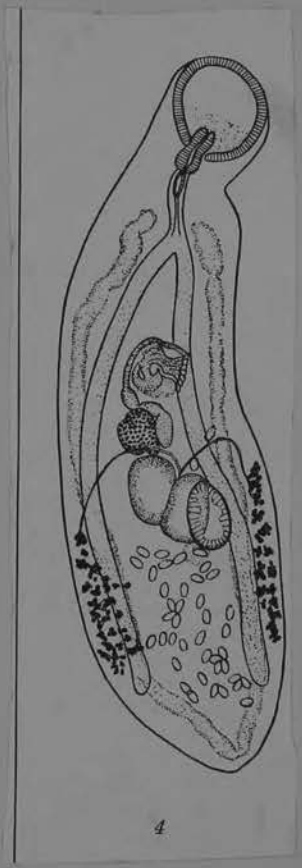
Length 1.7, width 0.5. Oral sucker 0.24 wide, 0.22 long. Pharynx 0.12 long, 0.07 wide. Esophagus about 0.04 long. Acetabulum 0.15 long, 0.11 wide. Middle of genital sinus 0.75 from anterior end. Vitelline fields 0.45 long. Eggs 40 to 45 by 23 µ.

Host: Narcacion torpedo Klein
( = Torpedo Narce Risso)

Locality. Cape Blanc, Mauritania

Described in Bull. Com. Etud. Hist. Sci. Afriq. Occid. Francaise, vol. 19 : 489-492 1937. Out first in Ann. Parasit., March, 1937.

In "digestive tube"



4

## MONODHELMINTHIDAE Dollfus, 1937

### 24. *Monodhelmis arii* n. sp. Yamaguti, 1952

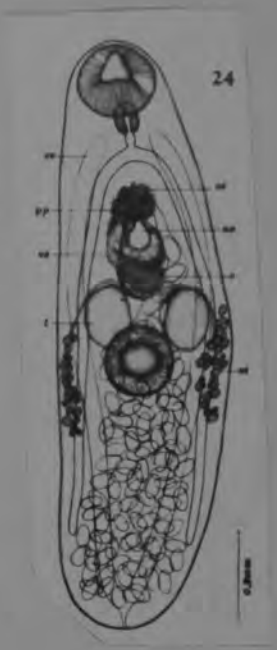
Pl. V, Fig. 24.

Habitat. Small intestine of *Arius* sp.

Material and locality. 13 mature specimens, seven fixed in acetic sublimate, stained with Heidenhain's hematoxylin; others fixed in alcohol, stained with Delafield's hematoxylin; Bandjermasin, Borneo.

Body flattened subcylindrical, with blunt ends, 0.75 – 1.32 mm in length 0.22 – 0.38 mm in maximum width at middle or near posterior extremity. Cuticle thin, unarmed (?). Oral sucker subterminal, 110 – 150×105 – 156 μ. Prepharynx practically absent. Pharynx 48 – 60×45 – 70 μ, its anterior end divided into three lobes. Esophagus 30 – 45 μ long by 20 – 30 μ wide, provided with moderately strong longitudinal muscle, bifurcating behind middle of anterior third of body. Ceca narrow, terminating some distance (0.2 mm in the type) in front of posterior extremity. Acetabulum very weakly muscular, 0.08 – 0.16 mm in diameter, situated just behind middle of body.

Testes subglobular to oval, unequal in size, 80 – 150×50 – 105 μ, placed almost symmetrically anterolateral to acetabulum just inside ceca. Vesicula seminalis elongate, 0.1 – 0.21 mm long, constricted into two portions; the posterior portion 45 μ wide in the type, lying obliquely ventral to ovary and immediately in front of right testis; the anterior portion 38 μ wide in the type, bordering on right side of atrial pouch mentioned below; its anterior end tapers abruptly to a short narrow duct 18 μ long, which opens into the oval pars prostatica measuring 42 μ long by 30 μ wide in the type. The prostate cells extend not only over the pars prostatica but also over the distal end of the vesicula seminalis as well as around the narrow duct between the seminal vesicle and the pars prostatica. Since the pars prostatica opens directly into the genital atrium, there is neither the ductus ejaculatorius nor the cirrus. Cirrus pouch also lacking. The genital atrium is up to 50 μ in inside diameter and provided with very strongly developed concentric circular muscle fibers forming a ring 56 – 85 μ in outside diameter. It develops posteriorly a flask-shaped muscular accessary organ presenting a very characteristic structure; the basal swelling of this organ is 70 – 100 μ in outside diameter and has a very thick wall consisting of an outer and an inner thin layer of longitudinal muscle and a much thicker middle layer of strong radial muscle, and lies in the median field at the anterior end of the middle third of the body, being covered up posteriorly by a scyphiform coat of small pyriform gland cells containing opaque hyaline protoplasm. A hyaline mass of varying size and shape, probably the secretory product of these gland cells, is seen at the bottom of the flask; sometimes it is simply globular or scyphiform, sometimes it may fill up the lumen of the flask and project into the genital atrium in form of a dumb-bell, or it may present on the anterior surface a number of pointed horn-like projections, assuming a sea-urchin-like appearance. The neck portion of the flask consists also of three layers of muscle fibers, the inner and the outer layer being continuous with the corresponding layer of the basal swelling, but the thickest middle layer is made up exclusively of concentric circular muscle fibers. Genital pore midventral, at posterior end of anterior third of body.



Ovary subglobular, 50 – 90 μ in diameter, situated dorsally in median line or only a little to one side of it posterodorsal to accessory genital flask. The receptaculum seminis and Laurer's canal have not been observed with certainty. Uterine coils occupying whole posttesticular intercecal field; when fully developed they extend more laterally and posteriorly, so that the posterior part of the body bulges out to attain the maximum width. The distal portion of the uterus ascends on the dorsosinistral side of the genital atrium and opens into the latter near the genital pore. Eggs numerous, elliptical, moderately thick-shelled, 45 – 69 × 23 – 39 μ, contained ovum segmented, but not yet fully embryonated



when laid. Vitellaria consisting of 30 – 40 small follicular acini, extending along each side of body outside intestine for a distance of 0.13 – 0.26 mm, commencing at level of testes or immediately behind it. The symmetrical vitelline ducts cross the ceca ventrally and running inwards along the anterior borders of the testes unite with each other in the median line between the two testes to form a compact vitelline reservoir which is usually transversely elongated oval and measures up to 38 μ in diameter. Excretory vesicle V-shaped, divided at posterior end of body into two long, wide, symmetrical arms extending forward dorsal to uterus and ceca as far as level of esophagus; common stem very narrow, only 20 μ long in the type. In the specimens fixed in alcohol the excretory arms appear dark brown owing to presence of very fine excretory granules, and present an uneven contour. Further details could not be made out.

The present species bears a close resemblance to *Monodhelmis torpedinis* Dollfus, 1937. The latter species is, however, too meagerly described to institute comparison. It seems to me that some misinterpretation is made by Dollfus in regard to the structure of the genital sinus and the position of the genital complex. This parasite is stated to have been found in the digestive tract of *Narcacion torpedo* but there is some doubt as to whether it is the natural habitat of the parasite. Secondary transmission due to ingestion of some natural teleostean definitive host may probably not be excluded. Dollfus' species is characterized by the oral sucker being definitely larger than the acetabulum (0.24×0.22 : 0.15×0.11) and by the two testes being oblique and contiguous with each other and separated from the intestinal limbs. In *Mehratrema dollfusi* Srivastava, 1939, and *M. polynemusinis* Chauhan, 1943, the cirrus pouch is stated to be well developed, but in the present species it is practically absent or obsolete if any, and the acetabulum is very poorly muscular as in *M. polynemusinis*. In this latter species the excretory arms extending to the oral sucker are convergent in the testicular zone in contrast with those of *Monodhelmis torpedinis* and *Monodhelmis arii*.

MONODHELMINTHIDAE Dollfus, 1937

*Monodhelmis philippinensis* n. sp.
(Fig. 2) Velasquez, 1961

*Host:* *Arius thalassinus* (Rupell).

*Location:* Intestine.

*Locality:* Quiape market, Manila, Philippines.

*Prevalence:* 13 gravid specimens from 2 hosts.

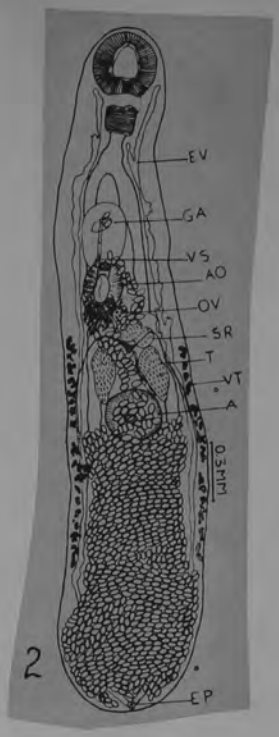
*Type and paratypes:* U.S. Nat. Mus. Helm. Coll. No. 39478, University of the Philippines, Dept. of Zoology, Helm. Coll. Nos. 74e; 395(3)$f_1$.

*Diagnosis:* (Based on 3 fairly extended specimens.) Body flattened, subcylindrical blunt at both ends, 2.9 to 3.5 long, 0.69 to 0.78 in maximum width. Cuticle thin, spinose. Oral sucker subterminal, 0.35 to 0.36 by 0.33 to 0.36. Prepharynx present, pharynx 0.14 to 0.16 by 0.15 to 0.18, bilobed anteriorly (fig. 2). Esophagus 0.14 to 0.16 by 0.05 to 0.07, bulbous distally. Ceca long and narrow almost reaching posterior extremity. Acetabulum 0.15 to 0.3 by 0.23 to 0.32, weakly muscular, about middle of body posterior to testes.

Testes pear-shaped, anterior end wider, blunt, posterior end narrower, pointed; symmetrical, intercecal, immediately anterior to acetabulum; right testis 0.18 to 0.28 long, 0.092 to 0.15 wide; left testis, 0.2 to 0.32 long, 0.1 to 0.14 wide. Left vas efferens (in type) with a peculiar pyriform, elongated sac adjacent to inner side of left testis. Vesicula seminalis 0.35 to 0.42 long, dilated at proximal end in type. Pars prostatica not clearly discernible. Prostate cells extending all over proximal end of vesicula seminalis and basal portion of accessory reproductive organ. Genital atrium muscular, 0.3 to 0.36 long, 0.23 to 0.25 wide, proximally provided with an accessory organ, cylindrical, flask-shaped with a swollen basal portion made up of two coats, an outer muscular one, 0.12 thick (in type) and a rather thin, less muscular inner layer. Lumen of flask-like structure filled with protoplasmic mass, rather dense at distal end. Anterior portion of flask dome-shaped with a spike-like anterior prostrusible structure. Genital pore mid-ventral at anterior third of body length.

Ovary subglobular 0.12 by 0.092 (in type). Receptaculum seminis prominent; Laurer's canal not seen. Uteri coils occupying entire post-testicular intercecal field; extracecal at posterior region in type. Ascending part of uterus opening into genital pore. Eggs numerous, segmented, not fully embryonated, 58 by 23 to 28 microns extending anteriorly not beyond level of testes and posteriorly about to last fifth of body. Vitelline ducts symmetrical, uniting mid-ventrally to form small vitelline reservoir between testes. Excretory vesicle V-shaped with two longitudinal arms, dorsal, extending anteriorly to posterior margin of oral sucker.

The present species closely resemble *Monodhelmis arii* Yamaguti, 1952, and the fish host belongs to the same genus as Yamaguti's host species. However, *M. philippinensis* must be considered as distinct because it differs from *M. arii* in the large body size, larger and pear-shaped testes, shape of accessory genital organ and extent of vitellaria and excretory arms.



MONODHELM 19

Genus: *Buckleytrema* ~~gen. nov~~. N. K. GUPTA, 1956

*Generic diagnosis.*—Monodhelminthidae Dollfus, 1937 emend. Body: elongate. Integument: Smooth. Suckers: oral sucker distinctly larger than acetabulum which is partially or completely pretesticular. Gut: prepharynx, pharynx and oesophagus present; intestinal caeca terminate blindly in the second half of body but far in front of the posterior extremity. Reproductive systems: Male—testes two, compact, obliquely situated one behind the other, post-acetabular or posterior testis alone post-acetabular and the anterior testis being partially or completely overlapped by the acetabulum; cirrus sac elongated, tubular, encloses the seminal vesicle and pars prostatica. Female—ovary pre-acetabular and pretesticular; vitellaria follicular, lateral, extra—or intercaecal, extending from the level of ovary to testes; uterus post-testicular. Eggs numerous. Accessory or the copulatory organ present. Genital atrium surrounded by a genital sucker-like structure continuous behind into an accessory organ. Excretory bladder U-shaped with long cornua.

**Type species**: *Buckleytrema indica* ~~n.sp.~~ N. K. GUPTA, 1956

*Buckleytrema indica* n.sp. (Fig. 7) N. K. GUPTA, 1956

A few specimens of *Buckleytrema indica* n.sp. were recovered from a marine cat-fish at Krusadai Island. The live worm is of whitish appearance and can be easily detected in the intestinal contents. Some of the specimens were flattened under slight pressure for toto preparations and others after narcotising with a weak solution of alcohol were fixed in Bouin's. Those flattened were also fixed in Bouin's Picro-Formol or hot 70% alcohol. The flattened specimens were stained with carmine stain (Gower's modified method) and sections with Ehrlich's acid haematoxylin and eosin. These trematodes, however, do not pick up stain so readily as other trematodes.

The fluke is elongated and it measures 2·69–4·94 mm. in length and 0·53–1·06 mm. in maximum breadth which occurs at the region of the testes. The body cuticle is smooth. The acetabulum is much smaller than the oral sucker and it lies in between the ovary and the testes. In some specimens it may be overlapped by the latter organ. In this unique parasite, the ovary is pre-acetabular and the testes post-acetabular. The acetabulum measures 0·08–0·13×0·08–0·12 mm., lies behind the ovary and close to the Mehlis' gland complex. It is longer than broad in most of the specimens.

The muscular oral sucker is comparatively much larger than the acetabulum and lies subterminally at the anterior end of the body. It is 0·28–0·4 mm. long and 0·28–0·46 mm. broad. The oral aperture is somewhat oval and is also directed subterminally. The prepharynx measures 0·032–0·048×0·08 mm. The pharynx, 0·08–0·14×0·08–0·14 mm. in size, lies behind the prepharynx. The oesophagus, with a width of 0·064–0·08 mm., extends for 0·17–0·48 mm. It bifurcates into two intestinal caeca which run along the lateral margins of the body and terminate in the second half of it but far in front of its posterior end.

The two somewhat spherical testes lie obliquely one behind the other in the intercaecal zone and behind the acetabulum. Sometimes the anterior testis may be partially covered over by the acetabulum. The anterior testis measures 0·096–0·28×0·096–0·24 mm. while the posterior testis is 0·096–0·28×0·096–0·22 mm. From the anterior aspect of each testis arises a vas efferens, the vasa efferentia meeting to form the vas deferens before penetrating into the cirrus pouch.

The vesicula seminalis is dumb-bell-shaped, its proximal portion completely filling the basal part of the cirrus pouch while the distal part can be made out from the wall of the cirrus pouch. The pars prostatica is sufficiently long and is surrounded by the prostate gland cells. The anterior part of this duct gradually narrows down to open into the genital sinus which is 0·064–0·076 mm. long and 0·064–0·079 mm. wide. It is surrounded by concentric layers of thick muscle fibres and is continued behind into an accessory organ or the copulatory organ. It is a muscular organ of 0·14–0·33×0·16–0·19 mm. in size and contains a prominent muscular papilla. The base of the accessory organ is surrounded by a cluster of gland cells.

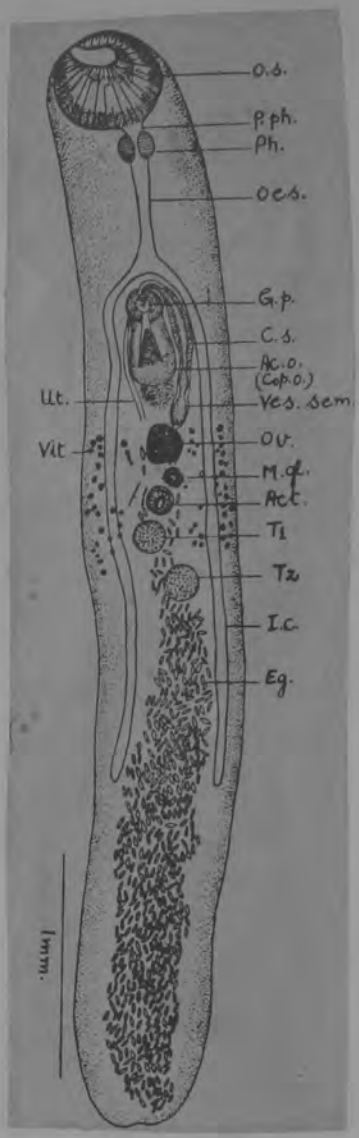
The ovary, 0·08–0·17×0·08–0·14 mm., lies in the median line in front of the acetabulum. The Mehlis' gland complex is placed posterior to the ovary. The receptaculum seminis is present. The uterus forms descending and ascending limbs, the boundaries of which could not be made out on account of the numerous eggs present in them. In front of the ovary, the uterus runs forward along the accessory organ to open into the genital sinus. The vitellaria are scanty and they are both extra- and intercaecal. They extend from the level of anterior border of the ovary back to the posterior testis but not passing behind it.

The eggs are operculate and measure 0·038–0·057×0·019–0·026 mm.

Host: Marine cat-fish.

Location: Intestine.

Locality: Gulf of Manaar (India).



BUCKLEYTREMA

# BURNELLUS Angel, 1971

## Generic diagnosis

Fellodistomatidae. Body small, flattened, minutely spined. Prepharynx, if any, very short, oesophagus short, alimentary caeca reaching nearly to posterior end of body. Suckers subequal, well developed, simple; acetabulum behind or near midbody. Genital pore median, just posterior to intestinal bifurcation; prominent genital atrium with well-developed muscular papilla, probably accessory copulatory organ. Testes simple, symmetrical, in region of acetabulum; no cirrus sac. Ovary mainly pretesticular; consisting of three contiguous lobes. Vitelline follicles few, lying ventrally to caeca, extending posteriorly from acetabular region. No *receptaculum seminis* or Laurer's canal. Uterus intercaecal, occupying area between acetabulum and hind end of body. Excretory bladder U-shaped, with wide arms reaching level of pharynx; flame cell formula 2 {(2+3)+(3+2)}. Cercaria trichofurcocercous, developing in lamellibranch.

Type species: *Burnellus trichofurcatus*.

*Burnellus* resembles the genera *Monodhelmis* Dollfus (1937*a*, *b*) and *Mehratrema* Srivastava (1939) quite closely in general appearance and in the relationships of the organs. It differs fundamentally from these genera in the nature of the muscular organ at the base of the genital sinus. Although an 'accessory organ' has been described in *Monodhelmis*, the structure is flask-shaped, and seems to be concerned with glandular secretions, and Yamaguti's (1958) term 'muscular accessory sac' seems a more appropriate one. *Mehratrema dollfusi* Srivastava (1939) was described as having 'a highly developed metraterm'. Chauhan (1943), describing *M. polynemusinis*, stated that a characteristic big pear-shaped sinus with highly muscular walls and deeply staining secretions inside it was a peculiarity of the species. He suggested that this had been misinterpreted as a peculiar metraterm – obviously referring to Srivastava's description of *M. dollfusi*. Gupta (1956) reported a few specimens of *M. dollfusi* and listed features in which they differed from Srivastava's description, including 'copulatory organ is distinct'. His figure 8 is not very detailed, but in the 'accessory organ (copulatory organ)' it shows a structure which looks like the prominent muscular papilla of *Burnellus trichofurcatus*; it could however, be Gupta's representation of a flask. Gupta's specimens were from a marine catfish (un-named). Srivastava's specimens were from *Scatophagus argus*, and *Mehratrema polynemusinis* was reported from three teleost hosts, none of which is a catfish. It is possible that Gupta's specimens may not be *M. dollfusi*. If his figure really represents a copulatory papilla, then his specimens do not belong to *Mehratrema*, and in this case, the genus has not, so far, been correctly recorded from catfish.

*Monodhelmis arii* Yamaguti (1952) and *M. philippinensis* Velasquez (1961) were recorded from marine catfish (*Arius* spp.) The type species *M. torpedinis* Dollfus, (1937*a*, *b*) was described from a single specimen, from a torpedo ray, *Narcacion torpedo*. Yamaguti (1952) suggested that this may not be the natural host of *M. torpedinis*, but had become infected by ingesting the natural teleost host. In addition to being found in catfish, *B. trichofurcatus* is also closer to *Monodhelmis* spp. in the absence of a cirrus sac, which is present in *Mehratrema*.

= NARCACION

-OVER-

*Burnellus trichofurcatus* resembles *Tandanicola bancrofti* Johnston (1927) (from the swim bladder of the same host) in its prominent muscular copulatory papilla and the general relationships of the genital sinus. The two genera are also similar in the arrangement of the reproductive systems and the absence of a cirrus sac, in the anterior part of the alimentary canal, and in the form and extent of the excretory bladder. *B. trichofurcatus* differs from *T. bancrofti* in its smaller size, in the more posterior extent of the intestinal caeca, in the more posterior position and the smaller number of follicles of the vitellaria, and in the greater extent laterally of the uterus, which is confined to the midregion of the postacetabular part of the body in *T. bancrofti*. It differs also in details of the reproductive system, such as the shape of the ovary and in the absence of Laurer's canal and *receptaculum seminis*.

*Monodhelmis* and *Mehratrema* have been placed by all authorities except Overstreet (1969) in the family *Monodhelminthidae Dollfus* (1937*b*), generally in separate subfamilies of which they are the type genera.

*Tandanicola* was made the type genus of Tandanicolinae Johnston (1927) and the subfamily was put in the Brachycoeliidae. Cable (1953) emended the diagnosis and put Tandanicolinae (to include also *Pseudosteringophorus* Yamaguti, 1940 and *Megalomyzon* Manter, 1947) in the Fellodistomatidae. The possible relationship of *Tandanicola* to *Monodhelmis* and *Mehratrema* was recognized by Yamaguti (1954) when he put the three genera, with *Prosogonarium* Yamaguti (1952), in Monodhelminthidae. Later (1958) he recognized two subfamilies in the family – Monodhelminthinae, with *Monodhelmis* and *Mehratrema*, and Tandanicolinae, with *Tandanicola* and *Prosogonarium*.

Mehra (1963), who included the subfamilies Monodhelminthinae, Mehratrematinae, Tandanicolinae, Prosogoniariinae and Atractotrematinae in the Monodhelminthidae, put this family, with the Fellodistomidae and the Gymnophallidae, in the Fellodistomoidea. Skrjabin (1953) classified *Monodhelmis* and *Mehratrema* in Monodhelmidae, and later (1966) raised Tandanicolinae (with *Tandanicola* as the only genus) to family rank. Overstreet (1969) regarded Monodhelminthidae as a subfamily in the Fellodistomatidae, and, by implication, placed his new genus *Claribula*, with an atrial papilla, in the subfamily. Cable (1953) based his classification of the Fellodistomatidae partly on life histories, one of the characters of the family being development of the cercaria in a lamellibranch. Because of this mode of development, and the structure of the cercaria, as well as in the characters of the adult, *Burnellus* obviously belongs in the Fellodistomatidae. Adult characters suggest that Overstreet (1969) is right in making Monodhelminthinae a subfamily of this family. Further knowledge of the life histories of genera assigned to the subfamilies Monodhelminthinae and Tandanicolinae will clarify their relationships. Until this can be done, I prefer not to assign *Burnellus* to a subfamily.

The excretory formula of *B. trichofurcatus* does not agree with that given by Cable (1953) for the Fellodistomatidae, namely $2\{(n+n)+(n+n)\}$ or $2\{(n+n)+(n)\}$, where often $n = 2$ or 3. In 1940 we reported (Johnston & Angel, 1940) five flame cells in each posterior and five in each anterior half of the body. Since Cable's paper appeared, I have checked the excretory pattern of the cercaria a number of times, and have never seen more flame cells. I have also examined living adult trematodes and have found the same number as reported for the cercaria. The connexions of the tubules from the flame cells with the main collecting tubes are difficult to determine, but the arrangement appears to be $2\{(2+3)+(3+2)\}$ in both cercaria and adult. (Dr John Pearson, of Brisbane, has told me (personal communication) that he noted the same formula for immature adult trematodes from *Tandanus tandanus* from the Brisbane River, in February 1969).

However, the cercaria of *B. trichofurcatus* agrees with Cable's (1953) emended diagnosis of the Brachylaemoidea, in which Cable placed the Fellodistomatidae, in having no flame cells in the tail but with prominent caudal excretory tube.

FROM ANGEL, 1971

*Burnellus trichofurcatus* (Johnston & Angel, 1940) ANGEL, 1971

HOST. *Tandanus tandanus* Mitchell, 1838 (Plotosidae).

LOCALITY. River Murray, South Australia.

LOCATION IN HOST. Intestine.

Type specimens deposited in South Australian Museum. Holotype, no. E836; paratypes, nos. E837–846. Nos. E836–E844, adults. Nos. E845, E846, young adults, obtained from small *Tandanus tandanus* after exposure to *Cercaria trichofurcata*.

No. E837, L.S., on two slides; No. E838, T.S., one slide. Other paratypes in Zoology Department, University of Adelaide, collection.

*Description*

Body flat, oval, sometimes narrower anteriorly (Fig. 5). Length 800–1270 (997), width 412–553 (477). Minute spines in closely set rows on dorsal and ventral surfaces. Suckers rounded. Oral sucker 153–200 (176) long by 165–200 (182) wide. Acetabulum behind or near midbody, 129–176 (153) long by 141–194 (165) wide. Ratio of width of oral to width of ventral sucker from 1:0·8 to 1:1.

Mouth subterminal; prepharynx very short; pharynx 68–87 (78) long × 58–76 (69) wide; oesophagus, generally contracted, in two extended specimens 105 long, caeca wide (up to 105 across), extending to near posterior end of body, sometimes one or both contracted to lie slightly closer to acetabulum than to end of body.

Excretory pore terminal; bladder U-shaped, with wide arms extending anteriorly to level of hind border of oral sucker.

Testes symmetrical, one sometimes slightly in advance of other, intercaecal, to sides of acetabulum or partly dorsal to it, extending beyond its anterior margin, sometimes contiguous, but generally separated by more or less extensive uterus, oval, 108–200 (153) long × 94–150 (113) wide.

Seminal vesicle 116 long × 50 wide, slightly sinuous, with thinly muscular walls, ventral to ovary, passing to right of genital atrium. *Pars prostatica* prominent, 84 long × 50 wide, surrounded with massed prostatic cells (Figs. 1–3), opening anteriorly in genital atrium. No cirrus sac. Genital atrium (Fig. 2) median, just posterior to intestinal bifurcation, consisting of large outer chamber with small inner part posteriorly. Stout muscular papilla (Fig. 2), 55 long × 30 wide, probably accessory copulatory organ, arising from base of inner chamber; base of papilla thickly surrounded with circular muscles. Atrium often full of eggs. Genital pore generally inconspicuous, with irregular outline, sometimes fully expanded into large circular opening (95 across).

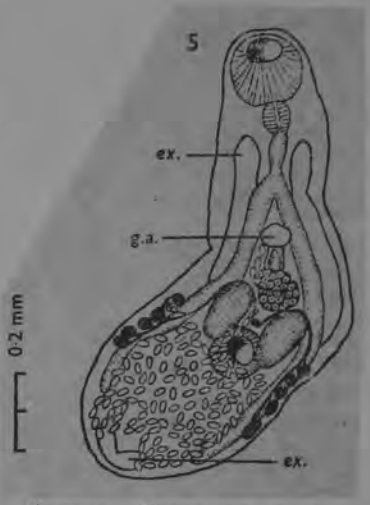
Ovary formed of three contiguous lobes, intercaecal, dorsal and partly posterior to genital atrium, mostly pretesticular, posterior end sometimes between anterior ends of testes; 79–129 (113) long × 95–163 (134) wide; largest lobe 63 long × 118 wide. Mehlis' gland (?) forming irregular, darkly staining mass ventral to ovary, with scattered groups of cells around genital atrium. Laurer's canal and *receptaculum seminis* absent.

Vitellaria consisting of about 6–12 follicles, ventral to caeca, extending posteriorly × 150–258 from level of anterior border of acetabulum. Largest follicle 71 by 37. Longitudinal and transverse vitelline ducts forming characteristic arch over anterior margin of testes (Fig. 5), with vitelline reservoir between testes, dorsal to or near anterior border of acetabulum.

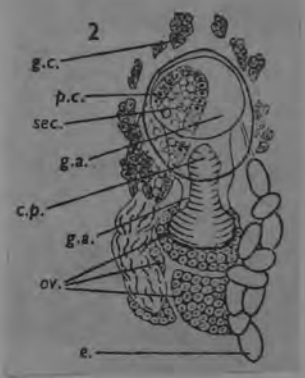
Uterus largely intercaecal, occupying area from acetabulum to hind end of body, then extending dorsal to acetabulum and between testes, opening into left side of genital atrium through short muscular portion (Fig. 1).

Eggs 34–40 (38) long × 18–21 (19) wide; yellow, thin shelled, with embryo well developed.

This species is regarded as belonging to a new genus, for which the name *Burnellus* is given.



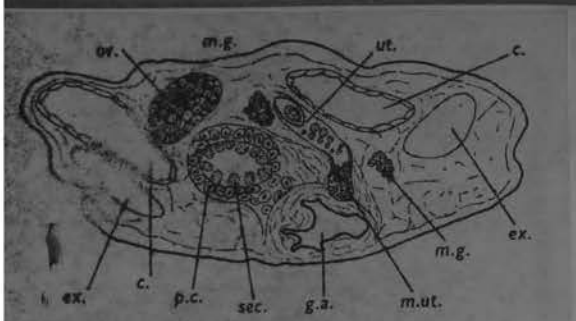

HOLOTYPE. DORSAL VIEW WITH GENITAL PORE AND VITELLARIA SHOWN AS IN VENTRAL VIEW.

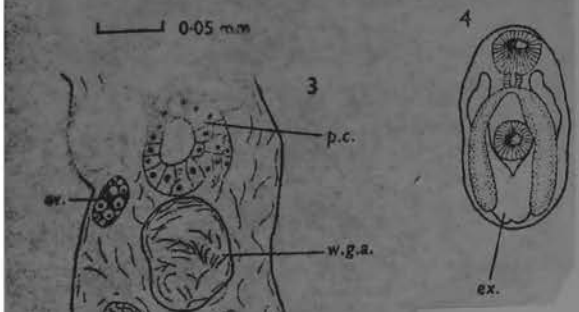


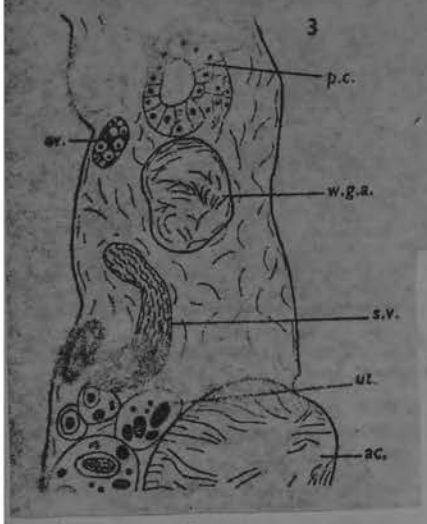

HOLOTYPE. VENTRAL VIEW.

FROM ANGEL, 1971

—OVER—




1. PARATYPE. SLIGHTLY OBLIQUE.
3. PARATYPE. LONGITUDINAL SECTION.
4. IMMATURE EX. INTESTINE OF ADULT *T. TANDANUS*.

BURNELLUS

Fellodistomatidae

CLARIBULLA Overstreet, 1969

**Claribulla** gen. n.

*Generic diagnosis*: Body elongate, spinose. Oral sucker cup-shaped or funnel-shaped. Acetabulum preovarian, enclosed in genital atrium. Pharynx elongate. Caeca long or short. Testes diagonal to tandem. Seminal vesicle preacetabular. Pars prostatica present. Atrial papilla present. Ovary compact, pretesticular. Seminal receptacle absent. Vitellaria in acetabular-ovarian zone. Eggs without filaments. Parasites in marine fishes. Type and only species:

*Claribulla* **longula** sp. n.
Figures 6 and 7

*Hosts*: *Albula vulpes* (5 of 7), type hosts; *Sphyraena barracuda* (1 of 1).

*Site*: Pyloric caeca, few in upper intestine. *Holotype*: U. S. N. M. Helm. Coll. No. 71316, paratype: No. 71376.

*Description* (based on 15 wholemounts and 1 sectioned specimen): Body bluntly rounded posteriorly, 0.9 to 2.7 long by 0.21 to 0.37 wide, the widest portion generally in hindbody; usually a slight constriction at acetabular level. Entire cuticle with minute spines. Oral sucker 0.10 to 0.24 long by 0.14 to 0.27 wide. Acetabulum enclosed in genital atrium, protrusible, 0.07 to 0.14 long by 0.09 to 0.13 wide. Sucker ratio 1:0.4 to 0.7. Forebody 29 to 44% of body length. Pharynx 0.07 to 0.19 long by 0.04 to 0.08 wide, in contact with oral sucker and connected to it by muscle fibers attached at or near equator of pharynx. Esophagus usually shorter than pharynx. Intestinal bifurcation much nearer oral sucker than acetabulum. Caeca sometimes swollen, extending to between acetabulum and near posterior end of body.

Testes diagonal to almost tandem, usually contiguous, spherical to slightly irregular; anterior testis 0.06 to 0.15 long by 0.08 to 0.18 wide, either sinistral or dextral to posterior testis; posterior testis 0.06 to 0.17 long by 0.10 to 0.16 wide. Posttesticular space 26 to 41% of body length. Cirrus sac absent. Seminal vesicle saccate, straight or bent, extending to a level anterior to or occasionally overlapping acetabulum. Pars prostatica sinuous or nearly straight, extending posteriorly from anterior portion of seminal vesicle; surrounded by numerous free prostatic cells. Ejaculatory duct inconspicuous, short and muscular. Atrial papilla large, muscular, located sinistrally, at a level anterior or lateral to acetabulum, protruding into muscular canal which extends posteriorly to approximately midacetabular level, then joining large muscular genital atrium.

Ovary rounded to slightly irregular, median or submedian, anterior to and almost always in contact with anterior testis, 0.06 to 0.12 long by 0.08 to 0.12 wide. Laurer's canal present. Proximal folds of uterus filled with sperm. Vitelline follicles clustered laterally, extending from ovarian level to or near acetabular level. Uterus extensive, filling most of postovarian spaces and extending to anterior border of acetabulum before joining genital atrium. Eggs usually collapsed, noncollapsed specimens 16 to 30 by 10 to 13 microns; 25 to 29 by 11 to 13 in living specimens.

Excretory vesicle Y-shaped; stem dividing at ovarian level with arms extending to pharyngeal level. Excretory pore terminal.

*Discussion*: I believe the genus *Claribulla* belongs in the family Fellodistomatidae. If I were to accept the validity of Monodhelminthidae Dollfus, 1937, then *C. longula*, with its atrial papilla, or accessory organ as referred to by Yamaguti, could be placed in that family. However, I am treating this family as a subfamily in the Fellodistomatidae. Yamaguti (1958:256-259) included the genera *Monodhelmis* Dollfus, 1937, *Mehratrema* Srivastava, 1939, *Tandanicola* Johnston, 1927, and *Prosogonarium* Yamaguti, 1952, in the Monodhelminthidae. Of these, *C. longula* resembles the species of *Monodhelmis* and *Tandanicola* by lacking a cirrus sac, although it differs from members of all four genera by having a preovarian acetabulum, an acetabulum enclosed in the genital atrium, and several other individual differences. The relationship of *Tandanicola* with the Fellodistomatidae was previously reported by Cable (1953:417), when he amended Tandanicolinae Johnston, 1927, to include *Megalomyzon* Manter, 1947, and *Pseudosteringophorus* Yamaguti, 1940, both recognized fellodistomatids, and transferred the subfamily from the Brachycoeliidae to the Fellodistomatidae.

*Claribulla longula* further links the monodhelminthids with the fellodistomatids by being similar to a group of the latter which includes *Pseudobacciger* Nahhas and Cable, 1964, *Bacciger* Nicoll, 1914, *Pentagramma* Chulkova, 1939, and *Faustula* Poche, 1926. *Bacciger* and *Pentagramma* were reviewed by Margolis and Ching (1965) without being assigned to a subfamily because of the unstable classification of the fellodistomatids. *Claribulla longula* differs from species of the above four genera in the arrangement of the gonads, the absence of a seminal receptacle, and the presence of an atrial papilla. A cirrus sac is absent in members of *Pseudobacciger* and indistinct in those of *Pentagramma*. The absence of a cirrus sac in *Pseudobacciger harengulae* (Yamaguti, 1938) (= *Bacciger h.*) and in

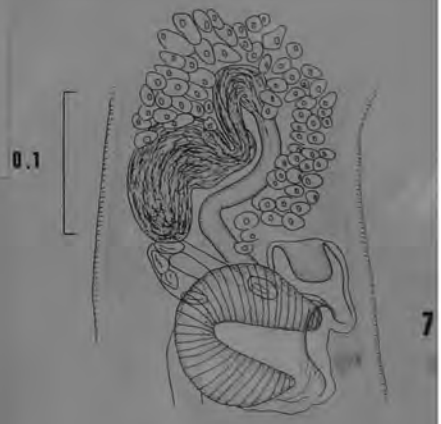




Figure 6. *Claribulla longula*, holotype, dorsal view. Figure 7. *Claribulla longula*, terminal reproductive organs, side view.

the illustration of *B. bacciger* (Rudolphi, 1819) by Stossich (1889) caused Yamaguti (1938 and 1958) to place *Bacciger* in the Heterophyidae and later in the Cryptogonimidae.

The absence of a cirrus sac in conjunction with the atrial papilla in *C. longula* is suggestive of a cryptogonimid. In the superfamily Opisthorchioidea, of which Cryptogonimidae is a member, however, a consistent and conspicuous feature is a seminal receptacle. Also, all known cercariae in that superfamily which leave the snail have eyespots which can be found, at least as scattered granular pigmented remnants, in the forebody of the adult (Cable, 1968: personal communication). If the cercaria of *C. longula* is found to have eyespots, this species should be transferred to the family Cryptogonimidae.

In Digenea lacking the usual protrusible cirrus, numerous modifications of terminal genitalia and adjacent portions are found in non-related groups, including the fellodistomatids. Convergent evolution of these modifications led parasitologists to place the presently recognized Microphallidae and Gymnophallinae as subfamilies of the Heterophyidae. More recent studies on the life histories of these three groups indicate that they represent three distinct orders, with two (Microphallidae and Heterophyidae) in the superorder Epitheliocystidia and one (Gymnophallinae) in the superorder Anepitheliocystidia.

The single specimen from *Sphyraena barracuda* may represent an accidental infection.

The name *Claribulla* is from *clara* (distinct) and *bulla* (knot), and refers to the muscular atrial papilla.

CLARIBULLA

## *Mehratrema* Srivastava, 1939

Generic diagnosis. — Monodhelminthidae, Monodhelminthinae: Body elongate. Oral sucker terminal or subterminal, followed by prepharynx. Pharynx small. Esophagus short, ceca terminating near posterior extremity. Acetabulum comparatively small, in midregion of body. Testes nearly symmetrical, pre-acetabular, intercecal. Cirrus pouch elongate, curved, containing vesicula seminalis, prostatic complex and ductus ejaculatorius. Genital pore a short distance posterior to intestinal bi-

[1]) Probably this is not the proper natural host. Secondary transmission is plausible in view of the second species being found in a teleostean host.



furcation, median or slightly to the left, suckerlike, with hollow accessory organ surrounded basally by gland cells. Ovary pretesticular, submedian. Receptaculum seminis and Laurer's canal present. Vitellaria follicular, extending in lateral fields along posterior portion of ceca. Uterus occupying almost entire postacetabular intercecal area; eggs small. Excretory arms convergent at level of testes, turning at level of esophagus in *M. polynemusinis*. Intestinal parasites of marine fishes.

Genotype: *M. dollfusi* Srivastava, 1939 (Pl. 103, Fig. 1246), in *Scatophagus argus;* India.

Other species: *M. polynemusinis* Chauhan, 1943, [1]) (Pl. 20, Fig. 258), in *Polynemus indicus, Muraenesox talabonoides* and *Sciaena* sp.; India.

MONADHELMIDAE

MEHRATREMA Srivastava, H.D., 1939



*Mehratrema*.—Thus the family **Monadhelmidae is divided into two sub-families, Monadhelminae and Mehratreminae, n. subff. The diagnosis of the sub-family Monadhelminae will be the same as of the type genus.**

DIAGNOSIS OF THE FAMILY MONADHELMIDAE

Medium sized, dorso-ventrally flattened distomes with well-developed suckers and digestive system. Testes two, symmetrical or obliquely tandem, intercaecal, pre-acetabular or overlapping the acetabulum. Cirrus sac and metraterm present or absent. Ovary overlapping testes or pre-testicular. Vitellaria follicular, lateral, of restricted growth. Uterus post-testicular; genital pore far in front of the acetabulum; eggs numerous. Excretory bladder U-shaped with long cornua.

Parasites of marine fishes.

Type genus.—*Monadhelmis* Dollfus, 1937.

Diagnosis of the genus *Mehratrema* and the subfamily Mehratreminae :—

Medium sized distomes with spinose cuticle; cutaneous gland cells well developed. Suckers nearly equal; oral sucker subterminal; acetabulum post-equatorial and post-testicular. Prepharynx, pharynx and oesophagus present; caeca narrow and terminate blindly a little in front of the hinder end of body. Testes two, compact, almost symmetrically situated on either side of median line. Cirrus sac elongated, tubular and encloses vesicula seminalis, pars prostatica, ductus ejaculatorius and cirrus. Genital sucker present, situated at the junction of the first and middle thirds of body length. Ovary in front of left testis. Vitellaria follicular, lateral, extending from level of anterior margin of ovary or testes to last quarter of body length. Uterus post-testicular, eggs numerous, operculate; metraterm strongly developed and divisible into a basal cup-shaped part and an upper bell-shaped part with several chitinous arches inside. Excretory bladder U-shaped, with long cornua extending up to level of intestinal bifurcation.

Type genus.—*Mehratrema*.

Type species.—*M. dollfusi*.

The author is deeply grateful to the Director and the Pathologist of the Imperial Veterinary Research Institute, Mukteswar for their sympathetic interest in his work.

REFERENCE

Dollfus, R. P. (1937). *Ann. de Parasit.* **15, 2, 169-171.**

*Mehratrema*, gen. n., resembles somewhat the genus *Monadhelmis* Dollfus, 1937, in the relative position of the gonads, character of the pharynx, configuration of the uterus and the shape of the excretory bladder. The new form can, however, be easily distinguished from Dollfus's genus by the pre-testicular position of the ovary, presence of a well-developed cirrus sac, a peculiar metraterm and genital sucker and the anterior extent of the vitellaria. On account of the presence of a cirrus sac, genital sucker and a peculiar metraterm, a new sub-family is suggested for the Indian genus. The diagnosis of the new sub-family—Mehratreminae—will be the same as that of the type genus.

Monorchidae?

Monadhelmidae

MEHRATREMA Srivastava, 1939

(diagnosis of genus and subfamily Mehratreminae)

Medium sized distomes with spinose cuticle; cutaneous gland cells well developed. Suckers nearly equal; oral sucker subterminal; acetabulum post-equatorial and post-testicular. Prepharynx, pharynx and esophagus present; ceca narrow and terminate blindly a little in front of the hind end of body. Testes two, compact, almost symmetrically situated on either side of median line. Cirrus sac elongated, tubular, enclosing seminal vesicle, pars prostatica, ductus ejaculatorius and cirrus. Genital sucker present, situated at the junction of the first and middle thirds of body length. Ovary in front of testes left testis. Vitellaria follicular, lateral, extending from level of anterior margin of ovary and testes to last quarter of body length. Uterus post-testicular, eggs numerous, operculate; metraterm strongly developed and divisible into a basal cup-shaped part and an upper bell-shaped part with several chitinous arches inside. Excretory bladder ########## U-shaped, with long cornua extending up to level of intestinal bifurcation.

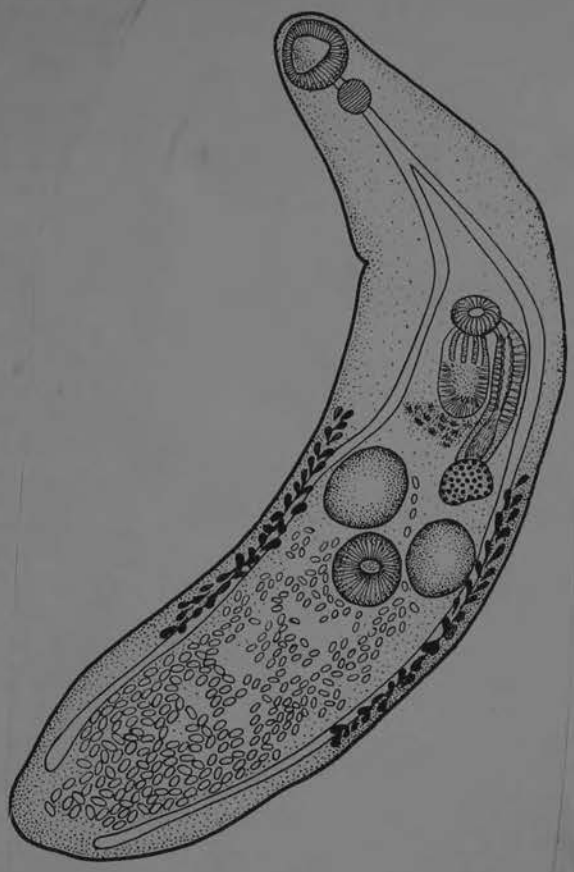
Type species: Mehratrema dollfusi Srivastava, 1939

The spelling MHHRATREMA is an obvious typographical error.

Reference: Indian Jour. Vet. Sci., 9:97-99

M. polynemusinis Chauhan, 1943

Mehratrema dollfusi Srivastava,1939



5

**MEHRATREMA DOLLFUSI. Gen. et. Sp. Nov.**

Srivastava, H.D., 1939

[Plate IV]

Host.—*Scatophagus argus* (Bloch.).

Habitat.—Small intestine.

Locality.—Karachi and Puri.

A large number of specimens of this parasite was collected from the small intestine of *Scatophagus argus* obtained from the Bay of Bengal and the Arabian Sea. The specimens collected at Karachi are all much smaller than those collected at Puri. The worms are poorly muscular and are rather sluggish. The flat, elongated body measures 1·46—3·52* in length and 0·4—0·78 in maximum breadth which occurs at the level of the testes. It is covered with minute spines and numerous well-developed cutaneous gland cells are present all over the surface. The suckers are nearly equal in size, 0·12—0·22 in diameter. The acetabulum is situated a little behind the anterior half of the body. The subterminal oral sucker opens posteriorly into a small pre-pharynx, which communicates with a pharynx of 0·05—0·09 in diameter. The oesophagus is of 0·1—0·25 length and bifurcates into two simple, narrow caeca which terminate blindly a little in front of the hinder end.

The two pre-acetabular, intercaecal testes are nearly spherical bodies, 0·08—0·26×0·08—0·22 in size, situated almost symmetrically one on either side of the median line at about the middle of body length. The cirrus sac is an elongated tubular structure, 0·26—0·56×0·06—0·14, containing an elongated bulb-shaped vesicular seminalis, 0·15—0·19×0·03—0·04, a small tubular pars prostatica, 0·04—0·08×0·01—0·02, surrounded by prostate gland cells, ductus ejaculatorius and cirrus. The genital pore is guarded by a feebly muscular genital sucker of about one-third of the size of the acetabulum and is situated at the junction of the anterior and middle thirds of the body length. [Plate IV].

The ovary, 0·08—0·18×0·06—0·18, lies a little in front of the left testis. The diffuse shell gland mass lies in the median line between the testes and ovary. A Laurer's canal is given off from the oviduct. A triangular, median yolk reservoir lies behind the shell gland complex. The vitellaria are composed of small, pear-shaped follicles arranged laterally overlapping the caeca from the level of the anterior margin of the ovary, rarely of testes, to approximately the last quarter of the body length. Often the vitellaria on either side are not of the same length. The vitelline duct of each side arches over the testes to form the median yolk reservoir. The uterus is well developed and is confined to the post-testicular and intercaecal space. Anteriorly the uterus terminates in a highly developed metraterm lying in the median line to the right of the cirrus sac. The latter has a peculiar shape and consists of a cup-shaped basal part, 0·09—0·2×0·1—0·2, and a bell-shaped upper part, 0·06—0·18×0·05—0·14, with several, longitudinal, chitinous arches inside. The basal part of the metraterm is surrounded by deeply staining gland cells, specially around its hinder end. The metraterm opens to the outside through the genital sucker. The eggs are numerous, operculate, light brown in colour and measure 0·03—0·053×0·022—0·026 in size.

The excretory bladder is U-shaped with its lateral cornua extending up to the level of the intestinal bifurcation.

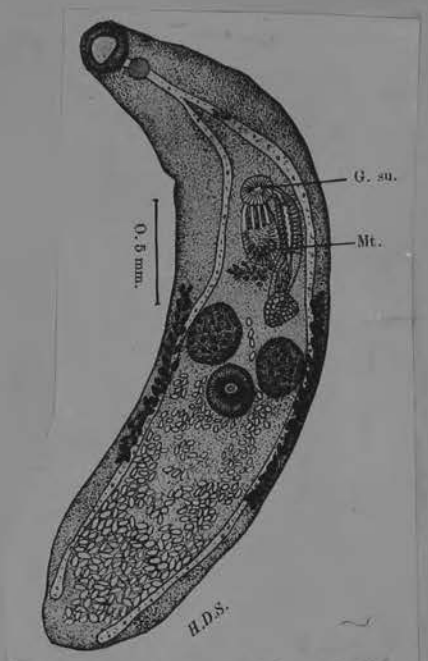
Monorchidae

Monodhelmidae (Dollfus, 1937)
Srivastava, 1939

## Mehratrema dollfusi Srivastava, 1939

1.46 to 3.52 by 0.4 to 0.78; spined.
Oral sucker 0.12 to 0.22; acetabulum the same. Acetabulum posterior to midbody.
Eggs 30 to 53 by 22 to 26 μ

Host: Scatophagus argus (Bloch), intestine
Locality: India (Puri and Karachi)



Ventral view of *Mehratrema dollfusi*, Gen. et. Sp. Nov.

M. polynemusinis Chauhan, 1943
differs in absence of peculiar metraterm
♀ in that uterine coils are entirely
postacetabular + other characters

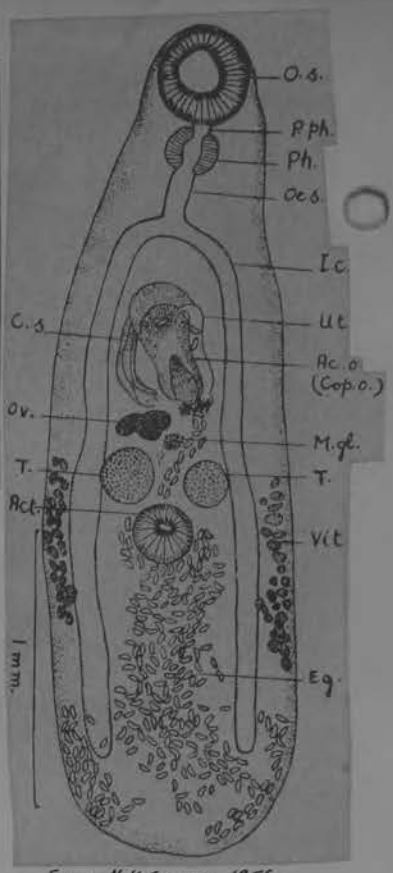
Genus: *Mehratrema* Srivastava, 1939

*Mehratrema dollfusi* Srivastava, 1939 (Fig. 8)

A few specimens of *Mehratrema dollfusi* were recovered from the intestine of a marine cat-fish dissected at Krusadai Island. These specimens differ from the original description of the parasite in the following features:—

(1) Oral sucker is slightly larger than the acetabulum. Oral sucker 0·22–0·32×0·25–0·33 mm. Acetabulum 0·22×0·19–0·2 mm.
(2) Ovary is 0·11–0·4×0·14–0·19 mm. in size and trilobed.
(3) Eggs measure 0·045–0·06×0·19–0·22 mm.
(4) An internal valve-like structure at the junction of the oesophagus and the intestinal caeca has been noticed.
(5) Copulatory organ is distinct.

From N.K. Gupta, 1956

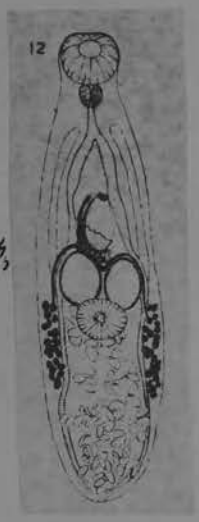



From N.K. Gupta, 1956

Ex. *Arius platystomus* Day
Ariidae

Karwar, Arabian Sea

From: Hafeezullah, 1971



~~MONODHELMINTHIDAE~~
Fellodistomidae
Monodhelminthinae

GU CHANG-DONG AND SHEN JI-WEI, 1979

**(10) *Mehratrema arii*, ~~sp. nov.~~** (fig. 10)

Three and four specimens were found respectively in the intestine of two out hree *Arius sinensis* Lacépède from Sanya, Hainan Island, Guangdong Province, May 8, 1958.

This species differs from the most closely related species *Mehratrema dollfusi* astava, 1939 in having the metraterm not widened, the anterior extent of vitel- level with the testes, the vitelline follicles elliptical, and eggs smaller. It dif- from another more closely related species *M. polynemausinis* Chauhan, 1943 in larger body size, the shape of the ovary, and the smaller eggs.

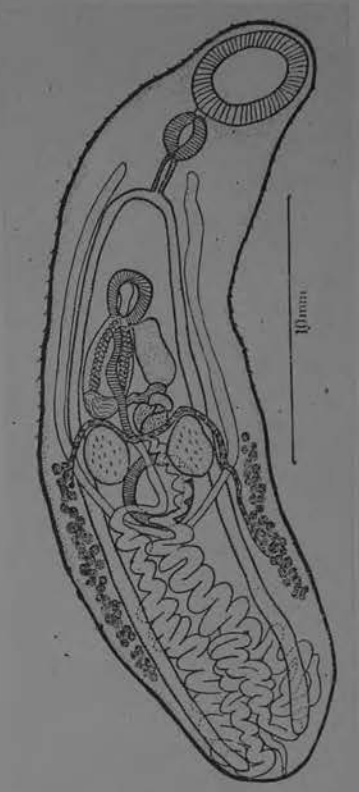
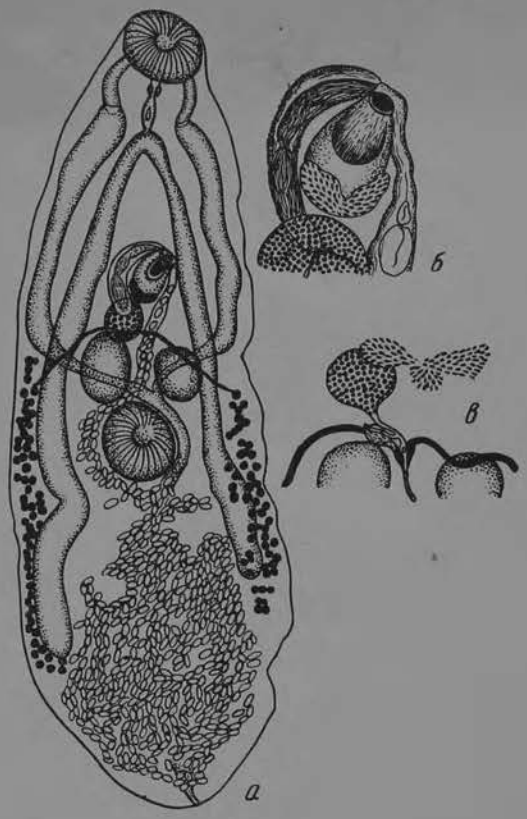



图 10 海鲶米哈吸虫 *Mehratrema arii*, 新种的整体背面

Mehratrema polynemusinis Chauhan,1943

Hosts: Polynemus indicus
Muraenesox talabonoides
Sciaena sp.

India




6

MEHRATREMA

Monodhelminthidae

*Prosogonarium* n. g. Yamaguti, 1952

*Generic diagnosis.* Monodhelminthidae. Body small, plump. Cuticle beset with minute spines. Oral sucker subterminal. Pharynx small. Esophagus moderately long. Ceca terminating at about junction of middle with posterior third of body. Acetabulum embeded in parenchyma in middle third of body, consisting of a compact mass of glandular cells with a central slit-like cavity whose anterior wall is occupied by semicircular bolsters of lamellar muscle fibers, and whose external opening is bordered by strong circular muscle. Testes entire, symmetrical, pre-acetabular, intercecal. Male terminal sac enclosing vesicula seminalis, pars prostatica and prostate cells, situated on one side of median line near intestinal bifurcation. No cirrus proper. Genital atrium large, opening midventrally in



front of ovary, receiving pars prostatica at its anterodextral corner and metraterm at its posterosinistral corner, with a muscular accessory sac between metraterm and false cirrus pouch. Ovary trilobate, situated in dorsal median field in front of and between two testes. Receptaculum seminis and shell gland ventral or posterior to ovary. Laurer's canal present. Vitelline gland consisting of few, comparatively large follicles, situated symmetrically along intestinal limbs lateral to testes or ovary. Uterus occupying most of hindbody, may intrude into lateral fields of forebody. Metraterm well differentiated. Eggs innumerable, embryonated. Excretory vesicle U-shaped; arms wide, reaching to near anterior extremity. Parasitic in marine or brackish water fishes.

Genotype. *Prosogonarium arii.*

Monodhelminthidae

PROSOGONARIUM Yamaguti,1952

Body plump,small. Cuticula with minute spines. Oral sucker subterminal. Pharynx small. Esophagus moderately long. Ceca ending at about junction of middle with posterior third of body. Acetabulum embedded in parenchyma in middle third of body, consisting of a compact mass of glandular cells with a central slit-like cavity whose anterior wall is occupied by semicircular blosters of lamellar muscle fibers, and whose external opening is bordered by strong circular muscle. Testes entire, symmetrical, preacetabular, intercecal. Male terminal sac enclosing seminal vesicle, pars prostatica and prostate cells, situated on one side of median line near intestinal bifurcation. No cirrus proper. Genital atrium large, opening midventrally in front of ovary, receiving pars prostatica at its anterodextral corner and metraterm at its postsinistral corenr, with a muscular accessory sac between metraterm and false cirrus pouch. Ovary trilobate, in dorsal median field in front of and between testes. Seminal receptacle and shell gland ventral or posterior to ovary, L.canal present. Vitelline glands considting of few, comparatively large follicles, situated symmetrically along intestinal limbs lateral to testes and ovary. Uterus occupying most of hind body, may intrude into lateral fields of forebody. Metraterm weal differentiated. Eggs innumerable, embryonated. Excretory vesicle U-shaped; arms wide, reaching to near anterior end. Parasitic in marine or brackish water fishes.

Type species: P.arii Yamaguti,1952
from Arius sp., Celebes

## *Prosogonarium* Yamaguti, 1952

Generic diagnosis. — Monodhelminthidae, Tandanicolinae: Body small, flattened pyriform to ellipsoidal, more or less pointed in front, broadly rounded behind, spinulate. Oral sucker subterminal, followed by very short prepharynx. Pharynx small, esophagus of moderate length, ceca terminating some distance short of posterior extremity. Acetabulum large, embedded in parenchyma at middle third of body, consisting of a compact mass of glandular cells, with slit-like central cavity, whose anterior wall is occupied by semicircular bolsters of lamellar muscle fibers, and whose external opening is bordered by strong circular muscle. Testes symmetrical, pre-acetabular, intercecal. Cirrus pouch enclosing vesicula seminalis, pars prostatica and prostate cells, situated on the right of median line near intestinal bifurcation. No cirrus proper. Genital atrium large, with muscular accessory (copulatory?) sac between metraterm and cirrus pouch, opening midventrally in front of ovary. Ovary divided into three large lobes, situated in dorsal median field in front of and between two testes. Receptaculum seminis formed by dilatation of Laurer's canal. Vitellaria consisting of few comparatively large follicles, extending symmetrically along intestinal limbs lateral to testes or ovary. Uterus extending nearly whole length and breadth of body. Metraterm well differentiated. Egg innumerable, embryonated. Excretory vesicle U-shaped; arms reaching to near anterior extremity; pore dorsal, close to posterior extremity. Parasitic in intestine of fishes.

Genotype: *P. arii* Yamaguti, 1952 (Pl. 20, Fig. 254), in *Arius* sp.; Bandjermasin.

Monodhelminthidae

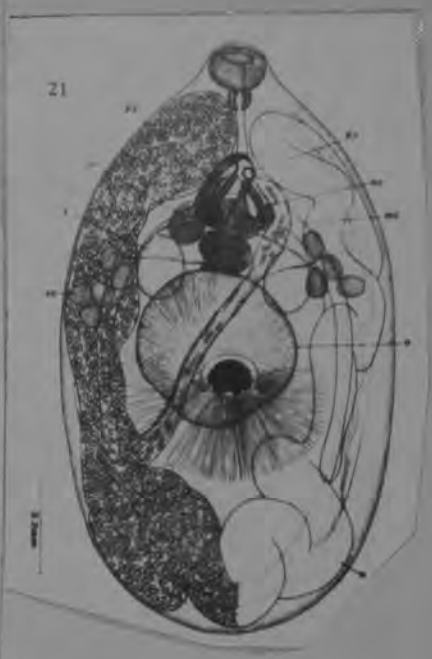
25. *Prosogonarium arii* n. g., n. sp. Yamaguti, 1952
Pl. V, Figs. 21 – 23.

Habitat Small intestine of *Arius* sp.

**Material and locality.** Numerous mature specimens fixed in acetic sublimate under a cover slip, stained with iron hematoxylin and mounted in balsam; Bandjermasin.

Body flattened pyriform or ellipsoidal, more or less pointed in front but broadly rounded behind, 1.2 – 2.6 mm in length with maximum breadth of 0.8 – 1.5 mm at about middle. Cuticle up to 4 μ thick, beset with minute slender spines 5 – 7 μ long. Subcuticular longitudinal and circular muscle fibers well developed, especially in neck region. At the anterior extremity is a hemispherical preoral lobe. In a younger paratype the conical anterior extremity is produced 65 μ beyond the oral sucker, along the anterior border of which open three pairs of the ducts of the larval penetration glands. Oral sucker subterminal, bowl-shaped, 0.1 – 0.175×0.16 – 0.2 mm; prepharynx very short; pharynx 65 – 90×70 – 96 μ, with its anterior end rolled up inwards. Esophagus 0.1 – 0.26 mm long, with comparatively weak longitudinal musculature, bifurcating just behind middle of anterior third of body. Ceca simple, arcuate, parallel to, and a little apart from, lateral margins of body, terminating at anterior end of caudal third of body. Acetabulum entirely different in structure from the usual form, embedded in body parenchyma at about midbody, consisting of a large (0.12 – 0.6 mm in diameter) globular mass of gland-like cells, with a central cavity and a slit-like ventral opening bordered by a thick layer of circular muscle from which fine muscle fibers are radiating. The cavity of the sucker is lined with cuticle 3 – 6 μ thick and reduced to a transverse slit (105 μ in transverse diameter in the type) owing to development, in its anterior wall, of 4 or 5 peculiar semicircular bolsters of lamellar muscle fibers. The largest outer bolster embracing the other three is 135 μ anteroposteriorly and 190 μ transversely in the type and shows a distinct lamellar structure, whereas the other bolsters are pressed against one another and appear chitinous and homogeneous. In the immature paratypes, however, all the bolsters still present a distinct original lamellar structure of fine muscle fibers.

Testes oval, 0.195 – 0.3×0.13 – 0.24 mm, situated symmetrically in front of acetabulum just inside ceca, with their long axes nearly parallel to longitudinal axis of body. The two vasa efferentia each arising from the anterior end of the corresponding testis, run inwards over the ventral surface of the ovary and open together





ito the vesicula seminalis at its posterior end. There is a large, ubcylindrical, comparatively thin-walled cirrus pouch extending n the right of the median line from the ventral side of the ovary to hat of the posterior end of the esophagus in an arcuate or rectangular curve with the convexity directed dorsolaterally. It is 0.25 – 0.3 nm long by 0.06 – 0.1 mm wide, and contains an elliptical or subylindrical vesicula seminalis 0.13 – 0.16 mm long by 50 – 90 μ wide nd a well developed prostatic complex. The pars prostatica is ubular, 0.1 – 0.12 mm long and may be dilated proximally to a width of 65 μ, and opens directly into the base of the genital atrium at its anterodextral corner. The prostate cells, filling up all available space within the pouch analogous to the cirrus pouch, are most numerous at the distal end of the pouch which covers up dorsally the anterior part of the genital atrium. There is neither ductus ejaculatorius nor cirrus. The genital atrium, oval in contour and lined with thick cuticle, lies ventral to the posterior end of the esophagus and opens ventrally by a comparatively wide aperture, whose margin is surrounded by a strong circular muscle. From the dorsal wall of the atrium projects dorsoposteriorly or posterolaterally a very conspicuous subcylindrical, muscular sac 0.09 – 0.18 mm long by 0.08 – 0.15 mm wide. It consists of circular muscle fibers and has a tubular central cavity opening into the genital atrium

see reprint, Fig 22, for lateral view

and lined with cuticle. From the base of this cavity reaching to near the posterior end of the sac arises a digitiform process which is 70 – 90 μ long by 12 – 20 μ wide and projects a little into the genital atrium, and apparently consists of extremely fine longitudinal muscle fibers. Around the posterior end of the sac, especially behind it, there is a compact mass of fusiform gland cells directed convergently toward the base of the digitiform process. What the use of this sac is I am at a loss to say, but from its structure and position it seems very likely that it serves as an accessory genital apparatus.

The ovary, 0.21 – 0.31 × 0.23 – 0.33 mm, consists of three subglobular to oval lobes and a small central cone from which the germiduct is given off, and lies in the dorsal median field behind the genital atrium, partly overlapping the accessory genital sac and the false cirrus pouch dorsally. In the somewhat contracted type it reaches to the anterior border of the acetabulum, but in an extended paratype it lies about 0.2 mm apart from this sucker; the ovarian

**and testicular zones may overlap each other or may be directly continuous. In the type the three lobes measure 0.165×0.13 mm, 0.15×0.12 mm and 0.165×0.12 mm respectively. The narrow germiduct (Fig. 23, inverted) arising from the backwardly pointing tip of the ventral cone of the ovary runs backward sinuously and widens out abruptly ventral or immediately posterior to the ovary to form an elongate, somewhat curved receptaculum seminis 0.09 – 0.12 mm long by 30 – 35 μ wide. The posterior end of this receptacle is produced forward to receive the backwardly directed, pointed end of the vitelline reservoir, and leads into the wider uterine duct which may serve as receptaculum seminis uterinum. The Laurer's canal arising from the posterior end of the seminal receptacle proceeds dorsally and then backwards and opens to the outside in the median line dorsal to the anterior portion of the acetabulum. The shell gland cells are rather loosely massed around the proximal end of the uterine duct and in the vicinity of the seminal receptacle. The uterus, when fully developed, occupies not only the hindbody but also the lateral fields of the forebody, and may well reach to the pharynx and esophagus. The well differentiated metraterm extends obliquely forward across the acetabulum, and passing between the left testis and the ovary crosses the left vas efferens ventrally, and running arcuately ventral or ventrolateral to the left cecum opens into the base of the genital atrium at its posterosinistral corner. It is moderately wide and provided with a layer of longitudinal muscle fibers. Eggs elliptical, thin-shelled, emryonated, 66 – 81 × 27 – 33 μ in life. Each vitelline gland forming a bunch of 5 or 6, large, subglobular, oval or elliptical follicles 48 – 110 μ long by 30 – 80 μ wide lies along the intestinal limb outside the testis or the ovary; the vitelline ducts from the two sides run almost transversely in front of the testes and unite together ventral to the ovary to form a triangular vitelline reservoir, which is 30 – 90 μ wide at the base, and whose pointed end is directed toward the distal end of the seminal receptacle. The large excretory pore, surrounded by circular muscle fibers, lies on the middorsal side of the body 0.12 – 0.4 mm from the posterior extremity; the excretory vesicle consists of two wide, symmetrical, arcuate arms running forward by the sides of the acetabulum, and crossing the intestine ventrally just lateral to the testes reach to the pharynx or the esophagus, so that it assumes approximately a U-shape; the collecting vessel**

arising from the ventral side of the anterior end of each arm proceeds backward a short distance and divides into two tubules, an anterior and a posterior; the anterior tubule ascends toward the oral sucker, while the posterior descends as far back as the posterior extremity.

The present worm bears a certain resemblance to *Tandanicola* Johnston, 1927, especially in the presence of an accessory genital organ and in the general topography of the digestive and reproductive organs as well as in the shape of the excretory vesicle. It cannot, however, be included in this genus and in the subfamily Tandanicolinae Johnston, 1937, because of marked differences in the structure of the acetabulum, in the presence of a male terminal sac, in the absence of the genital sac in the sense of Johnston (shown in his text-figures as c.s. = cirrus sac!), and in the excessive development of the uterus. In Johnston's species the uterus is confined to the median field, whereas in our species it may occupy nearly all available space in the whole body. Furthermore, it is to be noted that the seminal receptacle is a mere dilatation of the germiduct in the present parasite, whereas in the Australian species it is formed by dilatation of the Laurer's canal which is stated to arise "immediately before the oviduct enters the shell gland." In *Monodhelmis* Dollfus and *Mehratrema* Srivastava the acetabulum is poorly developed and nearly as large as oral sucker or even smaller, the ovary is unlobed, the uterus does not form extracecal loops, and the vitellarian follicles are much smaller, more numerous and more extensive than in the present worm.

A new genus *Prosogonarium* is proposed, and assigned to the family Monodhelminthidae Dollfus, 1937.

PROSOGONARIUM

## Tandanicolinae Johnston, 1927

Subfamily diagnosis. — Monodhelminthidae: Body pointed in front, rounded behind. Ceca extending a little, if any, beyond acetabulum. Acetabulum simple or complex, in middle third of body. Testes symmetrical. Cirrus pouch present or absent. Ovary submedian, lobed. Vitellaria overlapping ceca in front of acetabulum. Uterine coils in hindbody, may extend into esophageal zone.

### Key to genera of Tandanicolinae

Cirrus pouch present; uterine coils extending into forebody *Prosogonarium*
Cirrus pouch absent; uterine coils confined to median field of hindbody ..... *Tandanicola*

### *Tandanicola* Johnston, 1927

Generic diagnosis. — Monodhelminthidae, Tandanicolinae: Body fairly broad, pointed in front and rounded behind, spinulate. Oral sucker subterminal, a little smaller than acetabulum, directly followed by pharynx. Esophagus short, ceca half-long. Acetabulum simple, in middle third of body. Testes juxtaposed in front of acetabulum. Vesicula seminalis bipartite; pars prostatica well differentiated; both free in parenchyma. Neither cirrus nor cirrus pouch. Genital atrium with muscular accessory organ (copulatory sac of Johnston), opening in median line a little posterior to intestinal bifurcation. Ovary consisting of few rounded lobes, submedian, pretesticular. Vitellaria consisting of comparatively few follicles, lying laterally above ceca, pre-acetabular. Uterus mainly postacetabular, confined to median field. Excretory vesicle practically U-shaped. Parasitic in air bladder of freshwater fishes.

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[1]) The specific name should be emended to *polynemi*.



Genotype: *T. bancrofti* Johnston, 1927 (Pl. 20, Fig. 261), in *Tandanus tandanus;* Burnett Riv., Queensland.

**Tandanicola bancrofti,** ~~n. gen., n. sp.~~ T. H. JOHNSTON, 1927 Monodhelminthidae

B. Figs. 1-5.

This semi-transparent trematode was collected from the gas bladder of *Tandanus tandanus*, from the Burnett River, at Eidsvold, by Dr. Bancroft and his daughter, Dr. J. M. Mackerras, while Mr. H. Tryon forwarded some from the same host species from the Condamine River, near Warwick, Queensland.

Preserved specimens are very pale, strongly flexed ventrally, the oral sucker more or less underlying the acetabulum, and the posterior end may also be bent somewhat ventrally, while the lateral edges may be slightly inturned. The largest specimen, when slightly compressed, measured about 3·8 mm. in length by 2 mm. in breadth, the greatest width being in the vicinity of the acetabulum, which is situated in the midbody. The anterior end narrows somewhat, but the posterior is rounded. The mouth is subterminal. Both suckers are well developed, especially the ventral, their respective diameters being 0·38 mm. and 0·48 mm., the ratio being about 4 : 5. The cuticle is smooth, except anteriorly, where it is very minutely scaly (under high power).

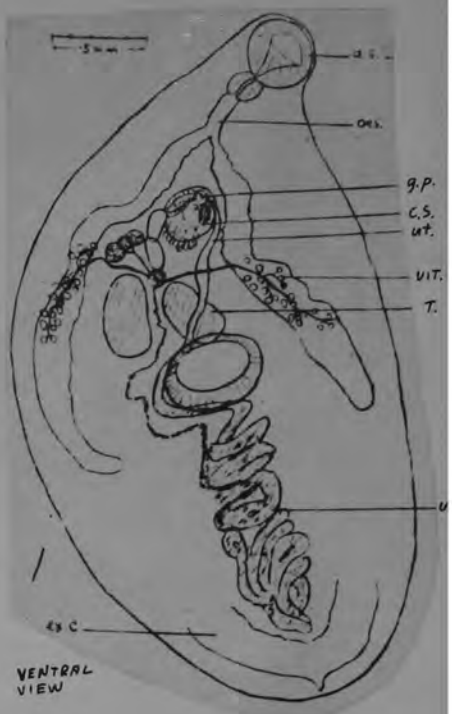
The pharynx, which has a diameter of about 0·17 mm. and a length of about 0·15 mm., is succeeded by an oesophagus 0·2 mm. to 0·3 mm. long; the latter branching into the two intestinal crura, which are fairly even in diameter and extend only slightly beyond the acetabular level. The inner portion of each crus may be somewhat crinkled.

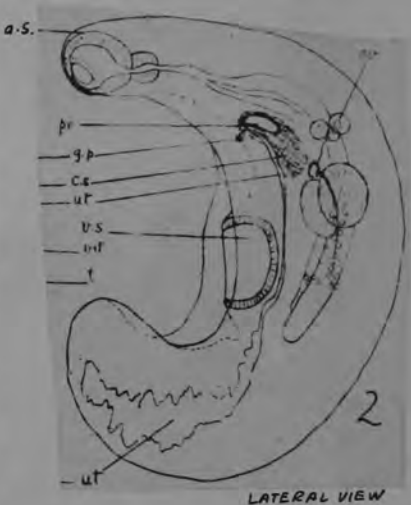
The excretory canals form a U with very long, wide limbs with sacculate walls and extending anteriorly almost to the pharynx, and lying laterally from the intestinal crura. The pore is terminal.

The testes are slightly elongate, nearly elliptical, measuring 0·4 mm. by 0·22 mm., lying side by side, being separated by the uterine canal. They are situated just in front of the acetabulum, whose anterior border they may partly overlie. There is a prominent elongate swollen vesicula seminalis on the right of the median line, extending from the region of the shell gland forwards beside the ovary, between the latter and the genital sac. It may underlie portion of the ovary, while its anterior region is closely adjacent to and may partly overlie the sac. It then enters the latter to become a rather wide elongate rounded structure with markedly glandular walls, presumably constituting a prostatic region. There arises a very short duct from its anterior end to terminate in a strongly-folded pouch lying in anterior portion of the genital atrium, some distance in front of the papilla. The arrangement of the various parts is somewhat like that occurring in *Transcucilla*.

The genital sac is a conspicuous organ whose size varies in different specimens (0·15 mm. long by 0·15 mm. broad; 0·4 mm. by 0·2 mm.). It possesses abundant longitudinal and circular muscle fibres, while its exterior is provided with numbers of large cells which are especially numerous around the posterior end of the organ. They appear to be glandular. Projecting into the lumen of the sac is a very prominent copulatory papilla which is not traversed by the male duct. It varies in form in the different specimens examined, being broadly rounded in some and more or less conical in others (0·08 mm. long by 0·09 mm.; 0·08 mm. by 0·08 mm.; 0·18 mm. by 0·07 mm., an elongate conical form), according to the degree of retraction. Its cavity contains abundant longitudinal muscle fibres inserted into the tip of the organ, while the surrounding copulatory sac is richly supplied with circular muscle fibres. The lumen of the atrium varies in dimensions according to the degree of retraction of the papilla; but its walls, like those of the papilla, are very strongly chitinised. They are also thrown into a series of very prominent longitudinal or spiral ridges when the papilla is retracted. The lumen is not straight, the outer part being bent or twisted more or less spirally, and projecting anteriorly to the genital pore which partly underlies the sac. Into the anterior part of the atrium there enter the uterus (metraterm) and the ejaculatory duct adjacent to a strongly folded pouch-like part of the wall in each case. The genital pore lies in the midline about midway between the two suckers, and is an insignificant aperture when the papilla is fully retracted. It then has strongly infolded walls like those of the atrium, but when the papilla is protruded through it, the lumen becomes more circular. The pore possesses a strong sphincter.

The ovary consists of three larger and one or two smaller rounded vesicles, some of which partly overlie others, the organ being situated on the right side in front of the right testis and between the intestine and vesicula seminalis, sometimes overlying part of the latter and of the genital sac. The oviduct travels inwardly and somewhat posteriorly towards the midline, to receive the common yolk-duct or reservoir, then passes upwards to enter the shell gland, which measures 0·8 to 0·13 mm. in diameter. The latter lies ventrally to the yolk reservoir and is situated between, or just in front of, the anterior borders of the testes. Laurer's canal arises ventrally, immediately before the oviduct enters



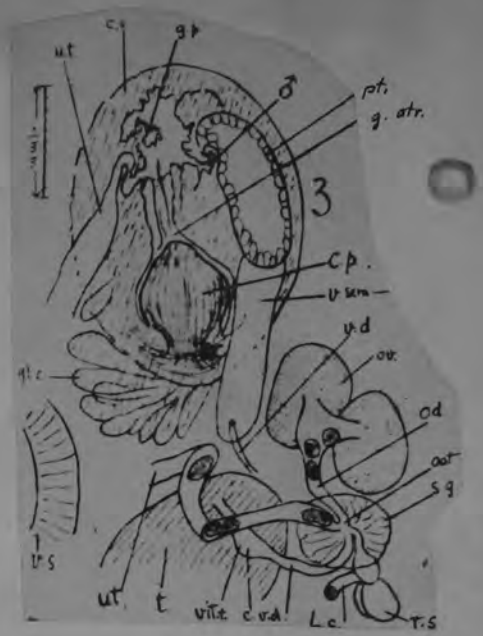





-OVER-

he shell gland, and curves around the latter dorsally as a very delicate tube which becomes swollen into one or more receptacula seminis and then fairly long nd canal-like. The ootyp continues backwards in a slightly undulating course s a narrow uterine duct, at first above the shell gland and later lying between he testes or below one of them, thence above or to one side of the acetabulum, ehind which it becomes widened into the uterus. The latter is thrown into a eries of loops and coils occupying the midregion of the postacetabular part of he parasite, excepting the posterior end. The duct eventually travels forwards s a fairly wide canal above the acetabulum or to one side of it, thence below the ft testis and vitelline duct, and then on the left side of the genital sac to rminate as a narrow tube opening into a cuticular pouch in the anterior part f the atrium. Eggs are thin-shelled, abundant, and measure 0·042 mm. by ·025 mm. (uterine eggs, 0·032 mm. by 0·025 mm.).

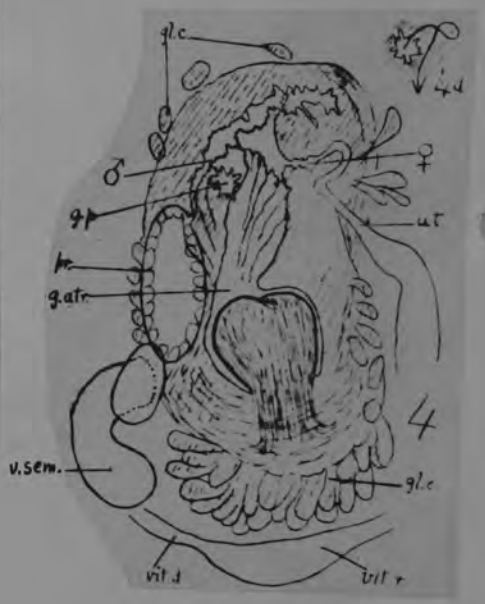
The yolk glands lie laterally in the second quarter of the worm and consist n each side of 20 to 30 follicles, lying directly above the intestine. They are on pproximately the same level as the testes, being preacetabular and postovarian. he main duct from each side passes directly inwards into the anterior border f the corresponding testis, the two ducts meeting just above the shell gland. hey may overlie the ventral lobe of the ovary, the uterus, and the posterior part f the vesicula seminalis, but are ventral to the main mass of the ovary. The




nited duct may be swollen to constitute a vitelline reservoir which narrows mmediately before joining the oviduct as it enters the shell gland.

In several specimens amphitypy was observed, the ovary, shell gland, and rminal portion of the uterus being on the left of the median line, instead of he right.

The general topography of the organs indicates that the worm belongs to he Brachycoeliidae, as diagnosed under subfamily title by Luhe (1909, p. 118). he absence of a typical cirrus sac and the position of the ovary and testes xclude it from Brachycoeliinae (s. str.). Though the Phagicolinae are devoid f a cirrus sac, yet the positions of the other organs prevent the inclusion of the arasite in that subfamily, and this remark would apply to the Lecithodendriinae. he parasite seems to be more nearly related to the Microphallinae in regard to he structure of the cirrus sac (Ward, 1901; Luhe, 1909), but the postacetabular osition of all organs except the uterus and genital sac in the subfamily definitely liminates the Australian parasite from it. A new genus *Tandanicola* and subamily Tandanicolinae are therefore proposed for its reception, the following rovisional generic diagnosis being suggested. *Tandanicola*, n. gen., Brachycoeliidae: Cuticle more or less minutely spiny; suckers well developed; repharynx absent; pharynx and oesophagus present; intestinal crura extending o vicinity of acetabulum; testes compact, lying at same level, preacetabular, ostovarian; ovary consisting of a few rounded lobes, pretesticular; cirrus sac bsent, replaced functionally by a muscular copulatory sac with well-developed opulatory papilla; genital pore preacetabular; vitellaria consisting of comparavely few follicles, lying laterally above intestinal crura, preacetabular; uterus ainly postacetabular, restricted to midregion; excretory vesicle practically -shaped. Type, *T. bancrofti*.



TANDANICOLA